Volume Contents

Number 1. January

1 Mathematical Analysis of the Dependence of Cell Potential on External Potassium in Corn Roots. JOHN M. CHEESEMAN AND JOHN B. HANSON

5 Increase in Linolenic Acid Is Not a Prerequisite for Development of Freezing Tolerance in Wheat. A. IAN DE LA ROCHE

9 Identification of 1,4-Benzoxazin-3-ones in Maize Extracts by Gas-Liquid Chromatography and Mass Spectrometry. MICHAEL D. WOODWARD, LUIS J. CORCUERA, HEINRICH K. SCHNOES, JOHN P. HELGESON, AND CHRISTEN D. UPPER

14 Quantitation of 1,4-Benzoxazin-3-ones in Maize by Gas-Liquid Chromatography. MICHAEL D. WOODWARD, LUIS J. CORCUERA, JOHN P. HELGESON, ARTHUR KELMAN, AND CHRISTEN D. UPPER

20 Functional Comparison of the Photosystem II Center-Antenna Complex of a Phycocyanin-less Mutant of *Cyanidium caldarium* with That of *Chlorella pyrenoidosa.* BRUCE A. DINER AND FRANCIS-ANDRÉ WOLLMAN

26 Biosynthesis of Photosystem II Reaction Centers, Antenna and Plastoquinone Pool in Greening Cells of *Cyanidium caldarium* Mutant III-C. BRUCE A. DINER AND FRANCIS-ANDRÉ WOLLMAN

30 Energy Transfer from the Phycobilisomes to Photosystem II Reaction Centers in Wild Type *Cyanidium caldarium.* BRUCE A. DINER

35 Distribution of Cytokinin-active Ribonucleosides in Wheat Germ tRNA Species. LESLIE A. STRUXNESS, DONALD J. ARMSTRONG, IAN GILLAM, GORDON M. TENER, WILLIAM J. BURROWS, AND FOLKE SKOOG

42 Effect of Diethylstilbestrol on Ion Fluxes in Oat Roots. NELSON E. BALKE AND THOMAS K. HODGES

48 Inhibition of Adenosine Triphosphatase Activity of the Plasma Membrane Fraction of Oat Roots by Diethylstilbestrol. NELSON E. BALKE AND THOMAS K. HODGES

53 Comparison of Reductions in Adenosine Triphosphate Content, Plasma Membrane-associated Adenosine Triphosphatase Activity, and Potassium Absorption in Oat Roots by Diethylstilbestrol. NELSON E. BALKE AND THOMAS K. HODGES

57 Independent Control of Fiber Development and Nitrate Reduction in Cultured Cotton Ovules. CHARLES A. BEASLEY, MARGARET A. EGLI, SHU-RAY CHANG, AND JOHN W. RADIN

61 Effect of Temperature on the Short Chain Fatty Acid-induced Inhibition of Lettuce Seed Germination. ROBERT R. C. STEWART AND ALEX M. M. BERRIE

63 Environmental Influences on Open Stomates of a Crassulacean Acid Metabolism Plant, *Agave deserti.* PARK S. NOBEL AND TERRY L. HARTSOCK

67 *In Vitro* Study of Mitochondrial Protein Synthesis during Mitochondrial Biogenesis in Excised Plant Storage Tissue. BRIAN G. FORDE, ROBIN J. OLIVER, AND CHRISTOPHER J. LEAVER

74 Subterminal Polygalacturonase, a Nonmacerating Enzyme, Attacks Pectate from the Reducing End. JOHN H. MCCLENDON

79 Purification of Leucine tRNA Isoaccepting Species from Soybean Cotyledons. I. Benzoylated Diethylamino Cellulose Fractionation, N-Hydroxysuccinimide Modification, and Characterization of Product. BRUCE R. LESTER AND JOE H. CHERRY

87 Purification of Leucine tRNA Isoaccepting Species from Soybean Cotyledons. II. RPC-2 Purification, Ribosome Binding, and Cytokinin Content. BRUCE R. LESTER, ROY O. MORRIS, AND JOE H. CHERRY

93 Tomato Peroxidase. Purification, Characterization, and Catalytic Properties. DEMETRI M. KOKKINAKIS AND JAMES L. BROOKS

100 Purine Nucleotide Metabolism of Germinating Soybean Embryonic Axes. JAMES D. ANDERSON

105 Light-Dark Regulation of Starch Metabolism in Chloroplasts. I. Levels of Metabolites in Chloroplasts and Medium during Light-Dark Transition. WERNER M. KAISER AND JAMES A. BASSHAM

109 Light-Dark Regulation of Starch Metabolism in Chloroplasts. II. Effect of Chloroplastic Metabolite Levels on the Formation of ADP-Glucose by Chloroplast Extracts. WERNER M. KAISER AND JAMES A. BASSHAM

114 Reversible Effects of Green and Orange-Red Radiation on Plant Cell Elongation. RICHARD M. KLEIN

117 Degradation of Cell Wall Polysaccharides during Tomato Fruit Ripening. KENNETH C. GROSS AND STEPHEN J. WALLNER

121 Cyanide-insensitive, Salicylhydroxamic Acid-sensitive Processes in Potentiation of Light-requiring Lettuce Seeds. KENNETH S. YU, CARY A. MITCHELL, SEMAHAT YENTUR, AND HENRY A. ROBITAILLE

126 Changes in the Strength of Lettuce Endosperm during Germination. KAR-LING TAO AND ANWAR A. KHAN

129 Endogenous Plant Growth Substances in Developing Fruit of *Prunus cerasus* L. VII. Isolation of Gibberellin A_{32}. MARTIN J. BUKOVAC, EIJI YUDA, NOBORU MUROFUSHI, AND NOBUTAKA TAKAHASHI

133 Photosynthetic Electron Transport in Isolated Maize Bundle Sheath Cells. GRIFFIN H. WALKER AND SEIKICHI IZAWA

139 Red Light and Auxin Effects on ^{86}Rubidium Uptake by Oat Coleoptile and Pea Epicotyl Segments. CARL S. PIKE AND ALICE E. RICHARDSON

142 Ethylene and Ethane Production from Sulfur Dioxide-injured Plants. GALEN D. PEISER AND SHANG FA YANG

146 Rapid Increase in UDP-Glucose during Early Wheat Embryo Germination. CHI P. CHEUNG AND ROBERT J. SUHADOLNIK

149 Effect of Ethylene and Oxygen on the Development of Cyanide-resistant Respiration in Whole Plant Mitochondria. ANNA RYCHTER, HARRY W. JANES, AND CHAIM FRENKEL

152 Movement of Kinetin and Gibberellic Acid in Leaf Petioles during Water Stress-induced Abscission in Cotton. THOMAS L. DAVENPORT, WAYNE R. JORDAN, AND PAGE W. MORGAN

156 Responses of *Atriplex spongiosa* and *Suaeda monoica* to Salinity. RICHARD STOREY AND R. GARETH WYN JONES
163 Movement to the Xylem Exudate of ^{86} Rubidium Accumulated in the Apex of Corn Roots. RICHARD C. SMITH
169 Effect of Silver Ion, Carbon Dioxide, and Oxygen on Ethylene Action and Metabolism. ELMO M. BEYER, JR.
174 Composition and Function of Thylakoid Membranes from Grana-rich and Grana-deficient Chloroplast Mutants of Barley. NIELS C. NIELSEN, ROBERT M. SMILLIE, K. W. HENNINGSEN, DITER VON WETTSTEIN, AND C. S. FRENCH
183 Ion Transport in Isolated Protoplasts from Tobacco Suspension Cells. I. General Characteristics. IRVIN J. METTLER AND ROBERT T. LEONARD
191 Ion Transport in Isolated Protoplasts from Tobacco Suspension Cells. II. Selectivity and Kinetics. IRVIN J. METTLER AND ROBERT T. LEONARD
195 Synthesis of a Possible Precursor of α-Amylase in Wheat Aleurone Cells. THOMAS W. OKITA, ROBERTO DECALEYA, AND LAWRENCE RAPPAPORT
201 Effect of Water Regime on Carbon Isotope Composition of Lichens. ADIVA SHOMER-ILAN, ARIE NISSENBAUM, MARGALITH GALUN, AND YOAV WAISEL
206 Soluble Polyvinypyrrolidine and Bovine Serum Albumin Adsorb Polyphenols from Soybean Suspension Cultures. NED R. SIEGEL AND RUSSEL K. ENNS
209 Distribution of Photosynthetic Enzymes between Mesophyll, Specialized Parenchyma and Bundle Sheath Cells of *Arundinella hirta*. BONNIE J. REGER AND IDA E. YATES
213 Effect of Bentazon, a Hill Reaction Inhibitor, on Symbiotic Nitrogen-fixing Capability and Apparent Photosynthesis. GABOR J. BETHLENFALVAY, ROBERT F. NORRIS, AND DONALD A. PHILLIPS
216 Intracellular Location of Carbonate Dehydratase (Carbonic Anhydrase) in Leaf Tissue. MALCOLM LEONARD REED
218 Effect of Red Light on Geotropism in Pea Epicotyls. JAMES A. MCARTHUR AND WINSLOW R. BRIGGS
221 Correction of Thermal Gradient Errors in Stem Thermocouple Hygrometers. BURLYN E. MICHEL
225 Corrections
i Instructions for Contributors

Number 2. February

227 Chloroplast Biogenesis. XXIV. Intrachloroplastic Localization of the Biosynthesis and Accumulation of Protoporphyrin IX, Magnesium-Protoporphyrin Monoester, and Longer Wavelength Metalloporphyrins during Greening. BARRY B. SMITH AND CONSTANTIN A. REBEIZ
232 Distribution of the Enzymes of Nitrogen Assimilation within the Pea Leaf Cell. ROGER M. WALLSGROVE, PETER J. LEA, AND BENJAMIN J. MIFLIN
237 Analysis of the Light-harvesting Pigment-Protein Complex of Wild Type and a Chlorophyll-*b*-less Mutant of Barley. JOHN J. BURKE, KATHERINE E. STEINBACK, AND CHARLES J. ARNTZEN
244 Kinetics of L-Alanine Escape from Xylem Vessels. AART J. E. VAN BEL, ELIAS MOSTERT, AND ADRIANUS C. BORSTLAP
248 Alkaline Band Formation in *Chara corallina*. Due to OH^- Efflux or H^+ Influx? WILLIAM J. LUCAS
255 Comparison of the Responses of Corn Root Tissue to Fusicoccin and Washing. JOHN W. GRONEWALD, JOHN M. CHEESEMAN, AND JOHN B. HANSON
260 Nature and Patterns of Proteins during Cotton Seed Development. EARL E. KING AND HARRY R. LEFFLER
264 Ionic Regulation for Cytokinin-dependent Betacyanin Synthesis in *Amaranthus* Seedlings. DAPHNE C. ELLIOTT
269 Analysis of Variability in the *Amaranthus* Bioassay for Cytokinins. Effects of Water Stress on Benzyladenine- and Fusicoccin-dependent Responses. DAPHNE C. ELLIOTT
274 Analysis of Variability in the *Amaranthus* Betacyanin Assay for Cytokinins. Effects of "Aging" Excised Cotyledons. DAPHNE C. ELLIOTT
277 Temperature-dependent Expression of Betacyanin Synthesis in *Amaranthus* Seedlings. DAPHNE C. ELLIOTT
280 Role of Ethylene in Abscisic Acid-induced Callus Formation in Citrus Bud Cultures. RAPHAEL GOREN, ARIE ALTMAN, AND ISRAEL GILADI
283 Borate Exchanges of *Lemna minor* L. as Studied with the Help of the Enriched Stable Isotopes and of a (n,α) Nuclear Reaction. MICHEL THELLIER, YVES DUVAL, AND MAURICE DEMARTY
289 A Study of Formate Production and Oxidation in Leaf Peroxisomes during Photorespiration. BERNARD GRODZINSKI
294 8-[^{14}C]Benzylaminopurine Translocation in *Phaseolus vulgaris*. ANGELO RAMINA, FERDINANDO PIMPINI, ANTONIO BONIOLO, AND FERRUCCIO BERGAMASCO
298 Aspects of 8-[^{14}C]Benzylaminopurine Metabolism in *Phaseolus vulgaris*. ANGELO RAMINA
301 Identification of Cultivar Differences in Seed Polypeptide Composition of Peanuts (*Arachis hypogaea* L.) by Two-Dimensional Polyacrylamide Gel Electrophoresis. S. MADANAPALLI MAHABOOB BASHA
307 Composition of Globoid Crystals from Embryo Protein Bodies in Five Species of *Cucurbita*. JOHN N. A. LOTT AND CATHERINE M. VOLLMER
312 Starch-synthesizing Enzymes in the Endosperm and Pollen of Maize. WARREN H. BRYCE AND OLIVER E. NELSON
318 Pyrophosphatase, Peroxidase and Polyphenoloxidase Activities during Leaf Development and Senescence. HEMANTA K. PATRA AND DINABANDHU MISHRA
324 Shifting the Phase of the Circadian Rhythm in Bioluminescence in *Gonyaulax* with Vanillic Acid. RICHARD S. KIESSIG, JEFFREY M. HERZ, AND BEATRICE M. SWEENEY

328 Light-dependent Induction of Polyunsaturated Fatty Acid Biosynthesis in Greening Cucumber Cotyledons. DENIS J. MURPHY AND PAUL K. STUMPF
336 Enzymic Mechanisms of Starch Breakdown in Germinating Rice Seeds. 7. Amylase Formation in the Epithelium. KAZUO OKAMOTO AND TAKASHI AKAZAWA
341 Polyamine Metabolism in Embryogenic Cells of *Daucus carota*. II. Changes in Arginine Decarboxylase Activity. MICHAEL J. MONTAGUE, TONI A. ARMSTRONG, AND ERNEST G. JAWORSKI
346 *In Vitro* Stability of Nitrate Reductase from Wheat Leaves. I. Stability of Highly Purified Enzyme and Its Component Activities. JOSEPH H. SHERRARD AND MICHAEL J. DALLING
354 *In Vitro* Synthesis of a Precursor to the Methionine-rich Polypeptide of the Zein Fraction of Corn. ULRICH MELCHER
359 Effects of Controlled Atmospheres on Production of Sesquiterpenoid Stress Metabolites by White Potato Tuber. Possible Involvement of Cyanide-resistant Respiration. LEO M. ALVES, EDWARD G. HEISLER, JOHN C. KISSINGER, JOSEPH M. PATTERSON, III, AND EDWIN B. KALAN
363 Seasonal Changes in the Structure and Function of Mitochondrial Membranes of Artichoke Tubers. A Requisite for Surviving Low Temperatures during Dormancy. ELZA CHAPMAN, LESLEY C. WRIGHT, AND JOHN K. RAISON
367 A Simple Theory Regarding Ambimobility of Xenobiotics with Special Reference to the Nematicide, Oxamyl. MELVIN T. TYREE, CAROL A. PETERSON, AND LLOYD V. EDGINGTON
375 Ultrastructural Comparison of *Cyanidium caldarium* Wild Type and III-C Mutant Lacking Phycobilisomes. FRANCIS-ANDRÉ WOLLMAN
382 *In Vitro* Binding of *Agrobacterium tumefaciens* to Plant Cells from Suspension Culture. KANJI OHYAMA, LAWRENCE E. PELCHER, ANGELIKA SCHAEFER, AND LARRY C. FOWKE
388 Relationship of Temperature to Stomatal Aperture and Potassium Accumulation in Guard Cells of *Vicia faba*. CYNTHIA A. ROGERS, ROBERT D. POWELL, AND PETER J. H. SHARPE
392 Interaction of Chloroplasts with Inhibitors. Location of Carotenoid Synthesis and Inhibition during Chloroplast Development. STUART M. RIDLEY AND JEANETTE RIDLEY
399 Effect of Carbon Dioxide on Photorespiration. BEN-AMI BRAVDO AND DAVID CANVIN
402 DNA Content of Free Living Rhizobia and Bacteroids of Various *Rhizobium*-Legume Associations. ALAN S. PAAU, JAMES ORO, AND JOE R. COWLES
406 Photosynthetic Rates of Citronella and Lemongrass. H. M. WALTER HERATH AND DOUGLAS P. ORMROD

Number 3. March

409 Importance of Glutamate Synthase in Glutamate Synthesis by Soybean Cell Suspension Cultures. JANE Y. CHIU AND PETER D. SHARGOOL
416 Analysis of Endosperm Sugars in a Sweet Corn Inbred (Illinois 677a) Which Contains the Sugary Enhancer (*se*) Gene and Comparison of *se* with Other Corn Genotypes. JANE E. FERGUSON, DAVID B. DICKINSON, AND ASHBY M. RHODES
421 Seasonal Patterns of Nitrate Reductase and Nitrogenase Activities in *Phaseolus vulgaris* L. ALVILIO A. FRANCO, JOAO C. PEREIRA, AND CARLOS A. NEYRA
425 Structure of Plant Cell Walls. IX. Purification and Partial Characterization of a Wall-degrading Endo-Arabanase and an Arabinosidase from *Bacillus subtilis*. LARRY WEINSTEIN AND PETER ALBERSHEIM
433 Composition of the Aliphatic Components of Suberin of the Endodermal Fraction from the First Internode of Etiolated *Sorghum* Seedlings. KARL E. ESPELIE AND P. E. KOLATTUKUDY
436 Comparison of the Molecular Weights of Proteins Synthesized by Isolated Chloroplasts with Those Which Appear during Greening in *Zea mays*. ALICE E. GREBANIER, KATHERINE E. STEINBACK, AND LAWRENCE BOGORAD
440 Short Term Phytochrome Control of Oat Coleoptile and Pea Epicotyl Growth. CARL S. PIKE, ALICE E. RICHARDSON, ELLEN R. WEISS, J. MARC AYNARDI, AND JANE GRUSHOW
444 Phytochrome Control of Cell Wall-bound Hydroxyproline Content in Etiolated Pea Epicotyls. CARL S. PIKE, HYONG UN, JOHN C. LYSTASH, AND ALLAN M. SHOWALTER
450 Carbon Dioxide Fixation by Lupin Root Nodules. II. Studies with ^{14}C-labeled Glucose, the Pathway of Glucose Catabolism, and the Effects of Some Treatments That Inhibit Nitrogen Fixation. WILLIAM A. LAING, JOHN T. CHRISTELLER, AND WILLIAM D. SUTTON
455 Osmotic Regulation. Physiological Significance of Proteolytic and Nonproteolytic Activation of Isofloridoside-Phosphate Synthase. HEINRICH KAUSS, KLAUS S. THOMSON, MARTA THOMSON, AND WOLFGANG JEBLICK
460 Freeze Preservation of Somatic Embryos and Clonal Plantlets of Carrot (*Daucus carota* L). LYNDSEY A. WITHERS
468 Isolation and Enzymic Characterization of *Euglena* Proplastids. ALEX DOCKERTY AND MICHAEL J. MERRETT
474 Effect of Water Vapor Pressure on the Thermal Decomposition of 2-Chloroethylphosphonic Acid. ISAAC KLEIN, SHIMON LAVEE, AND YOSEL BEN-TAL
478 Allantoin and Allantoic Acid in Tissues and Stem Exudate from Field-grown Soybean Plants. JOHN G. STREETER
481 Effects of the Herbicide San 9789 on Photomorphogenic Responses. MERTEN JABBEN AND GERALD F. DEITZER
486 Changes in Activity of Ribulose-1,5-Bisphosphate Carboxylase/Oxygenase and Three Peroxisomal Enzymes during Tomato Fruit Development and Ripening. BARRY A. MARTIN, JOHN A. GAUGER, AND N. EDWARD TOLBERT

490 Substrate Specificity for the Synthesis of Cyclic Fatty Acids by a Flaxseed Extract. BRADY A. VICK AND DON C. ZIMMERMAN
495 Cell Cycle-related and Endogenously Controlled Circadian Photosynthetic Rhythms in *Euglena*. DANIELLE L. LAVAL-MARTIN, DAVID J. SHUCH, AND LELAND N. EDMUNDS, JR.
503 Effects of Filipin and Steroids on Phytochrome Pelletability. NURIT ROTH-BEJERANO AND RICHARD E. KENDRICK
507 Interactions of Methionine and Selenomethionine with Methionine Adenosyltransferase and Ethylene-generating Systems. JÖRG R. KONZE AND HANS KENDE
511 Isolation and Partial Characterization of Transfer RNAs from *Astragalus bisulcatus*. PATRICIA A. YOUNG AND IVAN I. KAISER
518 Proline Accumulation in Water-stressed Barley Leaves in Relation to Translocation and the Nitrogen Budget. RAYMOND E. TULLY, ANDREW D. HANSON, AND CHARLES E. NELSEN
524 Effect of Growth Temperature on the Lipid and Fatty Acid Composition, and the Dependence on Temperature of Light-induced Redox Reactions of Cytochrome *f* and of Light Energy Redistribution in the Thermophilic Blue-Green Alga *Synechococcus lividus*. DAVID C. FORK, NORIO MURATA, AND NAOKI SATO
531 Proline Oxidase and Water Stress-induced Proline Accumulation in Spinach Leaves. ANTHONY H. C. HUANG AND ANTHONY J. CAVALIERI
536 Identification of Traumatin, a Wound Hormone, as 12-Oxo-*trans*-10-dodecenoic Acid. DON C. ZIMMERMAN AND CAROL A. COUDRON
542 Ontogeny of Photosynthetic Performance in *Fragaria virginiana* under Changing Light Regimes. THOMAS W. JURIK, JEAN F. CHABOT, AND BRIAN F. CHABOT
548 Effects of Light and 3-(3,4-Dichlorophenyl)-1,1-Dimethylurea on Levels of ATP in *Lemna paucicostata* 6746 and a Photosynthetic Mutant with Abnormal Flowering Responses. RICHARD A. GOWER AND HERBERT B. POSNER
552 Abscisic Acid Accumulation in Developing Seeds of *Phaseolus vulgaris* L. FRANCIS C. HSU
557 Linkage Analysis of Hydroxyproline-poor Glycoprotein from *Phaseolus vulgaris*. ROBERT G. BROWN AND WARWICK C. KIMMINS
562 Metalloenzyme Inhibitor from Kidney Beans. Partial Purification and Characterization. YOSHIO HOJIMA, HIROSHI MORIYA, CHIAKI MORIWAKI, AND CLARENCE A. RYAN
567 Changes in Pool Sizes of Free Amino Acids and Amides in Leaves and Plastids of *Zea mays* during Leaf Development. DAVID J. CHAPMAN AND RACHEL M. LEECH
573 Partial Characterization of a Potassium-stimulated Adenosine Triphosphatase from the Plasma Membrane of Meristematic and Mature Soybean Root Tissue. ROBERT L. TRAVIS AND MARTHA L. BOOZ
578 Glutamine Synthetase/Glutamine: α-Ketoglutarate Aminotransferase in Chloroplasts from the Marine Alga *Caulerpa simpliciuscula*. GEOFFREY H. MCKENZIE, AI L. CH'NG, AND KENWYN R. GAYLER
583 Derepression and Repression of Lysine-sensitive Aspartokinase during *in Vitro* Culture of Carrot Root Tissue. KATSUHIRO SAKANO
586 Amino Acid Levels in Carrot Cell Suspension Culture. No Correlation with Aspartate Kinase Isoenzyme Levels. SIMON W. J. BRIGHT, MAUREEN M. LEGGATT, AND BENJAMIN J. MIFLIN
589 Regulation of Auxin-induced Ethylene Production in Mung Bean Hypocotyls. Role of 1-Aminocyclopropane-1-Carboxylic Acid. YEONG-BIAU YU, DOUGLAS O. ADAMS, AND SHANG FA YANG

Number 4. April

591 Citrate and Succinate Uptake by Potato Mitochondria. DENNIS W. JUNG AND GEORGE G. LATIES
598 Effects of Cryoprotectants in Combination on the Survival of Frozen Sugarcane Cells. BERNARD J. FINKLE AND JANE M. ULRICH
605 Effects of Disalicylidenepropanediamines on Photosynthetic Electron Transport of Isolated Spinach Chloroplasts. NORBERT LAASCH, WERNER KAISER, AND WOLFGANG URBACH
609 Role of Auxin and Gibberellin in Differentiation of Primary Phloem Fibers. RONI ALONI
615 Phycobilisomes from Blue-Green and Red Algae. Isolation Criteria and Dissociation Characteristics. ELISABETH GANTT, CLAUDIA A. LIPSCHULTZ, JOSEPH GRABOWSKI, AND BURKE K. ZIMMERMAN
621 Amino Acid Uptake into Cultivated Mesophyll Cells from *Asparagus officinalis* L. JACQUELINE CHERUEL, MARC JULLIEN, AND YOLANDE SURDIN-KERJAN
627 A Nuclear Magnetic Resonance Study of Water in Cold-acclimating Cereals. LAWRENCE V. GUSTA, DAVID BRIAN FOWLER, PAUL CHEN, DAVID B. RUSSELL, AND DARRYL G. STOUT
635 Energy-linked Sulfate Uptake by Corn Mitochondria via the Phosphate Transporter. SAMIR ABOU-KHALIL AND JOHN B. HANSON
639 Methionine Metabolism and Ethylene Formation in Etiolated Pea Stem Sections. NORBERT SCHILLING AND HANS KENDE
643 Indirect Action of Benzyladenine and Other Chemicals on Flowering of *Pharbitis nil* Chois. Action by Interference with Assimilate Translocation from Induced Cotyledons. YUKIYOSHI OGAWA AND RODERICK W. KING
650 Photosynthetic Carbon Metabolism in Seagrasses. ^{14}C-Labeling Evidence for the C_3 Pathway. T. JOHN ANDREWS AND KAY M. ABEL
657 Transverse Viscoelastic Extension in *Nitella*. II. Effects of Acid and Ions. JEAN-PIERRE MÉTRAUX AND LINCOLN TAIZ

660 Chloroplast DNA Sequence Homologies among Vascular Plants. GAYLE K. LAMPPA AND ARNOLD J. BENDICH
669 Galactolipid Synthesis in *Vicia faba* Leaves. III. Site(s) of Galactosyl Transferase Activity. JOHN P. WILLIAMS, ELLEN E. SIMPSON, AND DAVID J. CHAPMAN
674 Galactolipid Synthesis in *Vicia faba* Leaves. IV. Site(s) of Fatty Acid Incorporation into the Major Glycerolipids. ELLEN E. SIMPSON AND JOHN P. WILLIAMS
677 Effect of Ethylene on Plasma Membrane Density in Kidney Bean Abscission Zones. DON E. KOEHLER AND LOWELL N. LEWIS
680 Characterization of the Destruction of Phytochrome in the Red-absorbing Form. HARRY J. STONE AND LEE H. PRATT
683 Binding of ColEl-kan Plasmid DNA by Tobacco Protoplasts. Nonexpression of Plasmid Gene. LOWELL D. OWENS
687 ATP Citrate Lyase from Germinating Castor Bean Endosperm. Localization and Some Properties. HANSJÖRG FRITSCH AND HARRY BEEVERS
692 Two Light Sources Differentially Affected Ferric Iron Reduction and Growth of Cotton. JOHN C. BROWN, CHARLES D. FOY, JESSE H. BENNETT, AND MERYL N. CHRISTIANSEN
696 Indole-3-acetic Acid Oxidase from Peas. I. Occurrence and Distribution of Peroxidative and Nonperoxidative Forms. STEPHEN D. BRYANT AND FORREST E. LANE
700 Salinity Effects on Leaf Anatomy. Consequences for Photosynthesis. DAVID J. LONGSTRETH AND PARK S. NOBEL
704 Photocontrol of the Germination of *Onoclea* Spores. V. Analysis of Germination Processes by Means of Temperature. CHIN-YU CHEN AND HIROSHI IKUMA
709 Plasmalemma Voltage Noise in *Chara corallina*. JACK M. FERRIER, CLAUDINE MORVAN, WILLIAM J. LUCAS, AND JACK DAINTY
715 Sorbitol-6-Phosphate Dehydrogenase from Loquat Fruit. MASASHI HIRAI
718 Variants of Soybean Cells Which Can Grow in Suspension with Maltose as a Carbon-Energy Source. MICHAEL LIMBERG, DEAN CRESS, AND KARL G. LARK
722 Protoplasts Surviving Freezing to −196 C and Osmotic Dehydration in 5 Molar Salt Solutions Prepared from the Bark of Winter Black Locust Trees. DAVID SIMINOVITCH
726 Absence of Lipid Oxidation during Accelerated Aging of Soybean Seeds. DAVID A. PRIESTLEY AND A. CARL LEOPOLD
730 Modeling the Transport and Utilization of Carbon and Nitrogen in a Nodulated Legume. JOHN S. PATE, DAVID B. LAYZELL, AND DAVID L. MCNEIL
738 Intracellular Localization of Some Key Enzymes of Crassulacean Acid Metabolism in *Sedum praealtum*. MARTIN H. SPALDING, MARK R. SCHMITT, S. B. KU, AND GERALD E. EDWARDS
744 Phloem Loading of Sucrose. Involvement of Membrane ATPase and Proton Transport. ROBERT T. GIAQUINTA
749 Salt Requirement for Crassulacean Acid Metabolism in the Annual Succulent, *Mesembryanthemum crystallinum*. ARNOLD J. BLOOM
754 Effect of Photosynthetic Intermediates on the Magnesium Inhibition of Oxygen Evolution by Barley Chloroplasts. STEVEN C. HUBER
758 Possible Role of Volatile Fatty Acids and Abscisic Acid in the Dormancy of Oats. ALEX M. M. BERRIE, DAVID BULLER, RONALD DON, AND WILLIAM PARKER
765 Effect of Daylength on Phenol Metabolism in the Leaves of *Salvia occidentalis*. GERRIT ENGELSMA
769 Isolation and Cell-free Translation of Total Messenger RNA from Germinating Castor Bean Endosperm. LINDA BOWDEN-BONNETT AND J. MICHAEL LORD
774 Abscisic Acid and the Photoperiodic Induction of Dormancy in *Salix viminalis* L. RONALD ALVIM, PETER F. SAUNDERS, AND RAIMUNDO S. BARROS
778 Characteristics of the Flash-induced 515 Nanometer Absorbance Change of Intact Isolated Chloroplasts. GÁBOR HORVÁTH, HANNU A. NIEMI, MAGDOLNA DROPPA, AND ÁGNES FALUDI-DÁNIEL
783 Properties and Intramitochondrial Localization of Serine Hydroxymethyltransferase in Leaves of Higher Plants. K. C. WOO
788 Dark Carbon Dioxide Fixation under Aerobic and Anaerobic Conditions in Maize Leaves after Preillumination in the Absence of Oxygen. Ribulose 1,5-Bisphosphate Can Serve as a Primary Acceptor of Carbon Dioxide. ELISABETH CREACH

Number 5. May

793 A Comparison of Glutamate Synthase Obtained from Maize Endosperms and Roots. ANN OAKS, KAREN JONES, AND SANTOSH MISRA
796 Assay of Chilling Injury in Wild and Domestic Tomatoes Based on Photosystem Activity of the Chilled Leaves. ROBERT M. SMILLIE AND ROBYN NOTT
802 Influence of Plant Sterols on the Phase Properties of Phospholipid Bilayers. BRYAN D. MCKERSIE AND JOHN E. THOMPSON
806 Reduction of Adenosine Triphosphate Levels in Susceptible Maize Mesophyll Protoplasts by *Helminthosporium maydis* Race T Toxin. JONATHAN D. WALTON, ELIZABETH D. EARLE, OLEN C. YODER, AND ROGER M. SPANSWICK
811 Ethylene Production by Callus and Suspension Cells from Cortex Tissue of Postclimacteric Apples. MORRIS LIEBERMAN, SHIOW Y. WANG, AND LOWELL D. OWENS

816 Variation in Nitrogenase and Hydrogenase Activity of Alaska Pea Root Nodules. GABOR J. BETHLENFALVAY AND DONALD A. PHILLIPS
821 Isolation of Intact and Functional Chloroplasts from Mesophyll and Bundle Sheath Protoplasts of the C_4 Plant *Panicum miliaceum*. GERALD E. EDWARDS, ROSS McC. LILLEY, STEWART CRAIG, AND MARSHALL D. HATCH
828 Sucrose Translocation and Storage in the Sugar Beet. ROBERT T. GIAQUINTA
833 Control of Leaf and Stem Growth in Light-grown Pea Seedlings by Two High Irradiance Responses. WILLIAM M. ELLIOTT
837 Factors Influencing the Development of Cyanide-resistant Respiration in Potato Tissue. HARRY W. JANES, ANNA RYCHTER, AND CHAIM FRENKEL
841 Photocontrol of Anthocyanin Synthesis. VII. Factors Affecting the Spectral Sensitivity of Anthocyanin Synthesis in Young Seedlings. ALBERTO L. MANCINELLI AND LYLE WALSH
847 Calcium Distribution in Globoid Crystals of *Cucurbita* Cotyledon Protein Bodies. JOHN N. A. LOTT, ERNEST SPITZER, AND CATHERINE M. VOLLMER
852 Enzymic Fractionation of the Stable Carbon Isotopes of Carbon Dioxide by Ribulose-1,5-bisphosphate Carboxylase. WILLIAM W. WONG, C. ROY BENEDICT, AND RUSSEL J. KOHEL
857 Analysis and Characterization of 3-(3,4-Dichlorophenyl)-1,1-Dimethylurea (DCMU)-resistant *Euglena*. I. Growth, Metabolic and Ultrastructural Modifications during Adaptation to Different Doses of DCMU. RÉGIS CALVAYRAC, JEAN-LOUP BOMSEL, AND DANIELLE LAVAL-MARTIN
866 Analysis and Characterization of 3-(3,4-Dichlorophenyl)-1,1-Dimethylurea (DCMU)-resistant *Euglena*. II. Modifications Affecting Photosynthesis during Adaptation to Different Doses of DCMU. RÉGIS CALVAYRAC, DANIELLE LAVAL-MARTIN, GUY DUBERTRET, AND JEAN-LOUP BOMSEL
873 Cytokinin Activity in *Lupinus albus* L. IV. Distribution in Seeds. JOANNE E. DAVEY AND JOHANNES VAN STADEN
878 Role of Potassium in Carbon Dioxide Assimilation in *Medicago sativa* L. TIMOTHY R. PEOPLES AND DAVID W. KOCH
882 Effect of Glyphosate on Auxin Transport in Corn and Cotton Tissues. J. R. BAUR
887 Effects of Glycidate on Carbon Dioxide Fixation with Isolated Spinach Chloroplasts. GÜNTER F. WILDNER AND CHRISTER LARSSON
892 Environmental and Genotypic Effects on the Respiration Associated with Symbiotic Nitrogen Fixation in Peas. JOHN D. MAHON
898 A Comparison of Acid-induced Cell Wall Loosening in *Valonia ventricosa* and in Oat Coleoptiles. MARK TEPFER AND ROBERT E. CLELAND
903 Isoenzymes of Pyruvate Kinase in Etioplasts and Chloroplasts. ROBERT J. IRELAND, VINCENZO DELUCA, AND DAVID T. DENNIS
908 Events Surrounding the Early Development of *Euglena* Chloroplasts. 14. Biosynthesis of Cytochrome *c*-552 in Wild Type and Mutant Cells. GEORGES FREYSSINET, GARY C. HARRIS, MAIMON NASATIR, AND JEROME A. SCHIFF
916 Solubility of Gases and the Temperature Dependency of Whole Leaf Affinities for Carbon Dioxide and Oxygen. An Alternative Perspective. JOHN D. TENHUNEN, JAMES A. WEBER, CONRAD S. YOCUM, AND DAVID M. GATES
924 Emission of Ethylene and Ethane by Le[illegible] Tissue Exposed to Injurious Concentrations of Sulfur Dioxide or Bisulfite Ion. RAY A. BRESSAN, LLOYD LECUREUX, LLOYD G. WILSON, AND PHILIP FILNER
931 Ethylene Production by Apple Protoplasts. JAMES D. ANDERSON, MORRIS LIEBERMAN, AND ROBERT N. STEWART
936 Differential Ion Stimulation of Plasmalemma Adenosine Triphosphatase from Leaf Epidermis and Mesophyll of *Nicotiana rustica* L. SUSAN LURIE AND DONALD L. HENDRIX
940 Effects of Ouabain and Low Temperature on the Sodium Efflux Pump in Excised Corn Roots. ROBERT F. DAVIS AND ANDREW Z. JAWORSKI
947 Effects of Variations in Daylength and Temperature on Net Rates of Photosynthesis, Dark Respiration, and Excretion by *Isochrysis galbana* Parke. LOUIS A. HOBSON, F. ALEXANDRA HARTLEY, AND DAWN E. KETCHAM
952 Potassium and Phosphate Uptake in Corn Roots. Further Evidence for an Electrogenic H^+/K^+ Exchanger and an OH^-/Pi Antiporter. WILLY LIN
956 Low Root Temperature Effects on Soybean Nitrogen Metabolism and Photosynthesis. STANLEY H. DUKE, LARRY E. SCHRADER, CYNTHIA A. HENSON, JEROME C. SERVAITES, ROBERT D. VOGELZANG, AND JOHN W. PENDLETON
963 Phospholipid Metabolism in Plant Mitochondria. Submitochondrial Sites of Synthesis. SALVATORE A. SPARACE AND THOMAS S. MOORE, JR.
973 Starch and Its Component Ratio in Developing Cotton Leaves. CHONG W. CHANG

Number 6. June

979 Pyrimidine Metabolism in *Lemna minor*. II. Specific Inhibition of Plastid Replication in a Higher Plant Cytidine Deoxyriboside. THOMPSON DEMETRIO PIZZOLATO AND HUGH FRICK
984 Reversal by Light of Ethylene-induced Inhibition of Spore Germination in the Sensitive Fern *Onoclea sensibilis*. An Action Spectrum. ROBERT W. FISHER AND W. SHROPSHIRE, JR.

989 Factors Affecting Crown Gall Tumorigenesis in Tuber Slices of Jerusalem Artichoke (*Helianthus tuberosus*, L.). EUGENE TANIMOTO, CARL DOUGLAS, AND WALTER HALPERIN

995 Long Distance Transport in *Macrocystis integrifolia*. I. Translocation of ^{14}C-labeled Assimilates. KLAUS SCHMITZ AND LALIT M. SRIVASTAVA

1003 Long Distance Transport in *Macrocystis integrifolia*. II. Tracer Experiments with ^{14}C and ^{32}P. KLAUS SCHMITZ AND LALIT M. SRIVASTAVA

1010 Influence of Cotyledons upon α-Amylase Activity in Pea Embryonic Axes. BILL D. DAVIS

1016 Involvement of Nonhistone Chromosomal Proteins in Transcriptional Activity of Chromatin during Wheat Germination. KOUICHI YOSHIDA, MAMORU SUGITA, AND KIMIKO SASAKI

1022 Tissue Distributions of Dhurrin and of Enzymes Involved in Its Metabolism in Leaves of *Sorghum bicolor*. MINEO KOJIMA, JONATHAN E. POULTON, SUSAN S. THAYER, AND ERIC E. CONN

1029 Relationships between Stomatal Behavior and Internal Carbon Dioxide Concentration in Crassulacean Acid Metabolism Plants. WILLIAM COCKBURN, IRWIN P. TING, AND LEONEL O. STERNBERG

1033 Time Course of Photosynthetic Response to Changes in Incident Light Energy. LOUIS J. GROSS AND BRIAN F. CHABOT

1039 Possible Involvement of the Alternative Respiration System in the Ethylene-stimulated Germination of Cocklebur Seeds. YOHJI ESASHI, SUSUMU WAKABAYASHI, YOSHIYA TSUKADA, AND SHIGERU SATOH

1044 Abnormal Stomatal Behavior and Hormonal Imbalance in *flacca*, a Wilty Mutant of Tomato. V. Effect of Abscisic Acid on Indoleacetic Acid Metabolism and Ethylene Evolution. MOSHE TAL, DOROT IMBER, AMNON EREZ, AND EPHRAIM EPSTEIN

1049 Spatial Distribution of Circadian Clock Phase in Aging Cultures of *Neurospora crassa*. SUBHUTI DHARMANANDA AND JERRY F. FELDMAN

1055 Temperature Interactions with Growth Regulators and Endogenous Gibberellin-like Activity during Seedstalk Elongation in Carrots. LARRY K. HILLER, WILLIAM C. KELLY, AND LOYD E. POWELL

1062 Red Light-inhibited Mesocotyl Elongation in Maize Seedlings. II. Kinetic and Spectral Studies. LARRY N. VANDERHOEF, PETER H. QUAIL, AND WINSLOW R. BRIGGS

1068 Malate Synthase Activity in Cotton and Other Ungerminated Oilseeds. A Survey. JAN A. MIERNYK, RICHARD N. TRELEASE, AND JOHN S. CHOINSKI, JR.

1072 Susceptibility of Plants to Vascular Disruption by Macromolecules. NEAL K. VAN ALFEN AND VICTORIA ALLARD-TURNER

1076 Uptake and Utilization of Xylem-borne Amino Compounds by Shoot Organs of a Legume. DAVID L. MCNEIL, CRAIG A. ATKINS, AND JOHN S. PATE

1082 Transport of Organic Solutes in Phloem and Xylem of a Nodulated Legume. JOHN S. PATE, CRAIG A. ATKINS, KATHY HAMEL, DAVID L. MCNEIL, AND DAVID B. LAYZELL

1089 Hysteresis in the Responses of Membrane Potential, Membrane Resistance, and Growth Rate to Cyclic Temperature Change. HADASSAH MELAMED-HAREL AND LEONORA REINHOLD

1095 Cysteinyl-tRNA Synthetase from *Astragalus* Species. JAMES N. BURNELL AND ALEX SHRIFT

1098 Effects of Red, Far Red, and Blue Light on Enhancement of Nitrate Reductase Activity and on Nitrate Uptake in Etiolated Rice Seedlings. HIDEO SASAKAWA AND YUKIO YAMAMOTO

1102 Photoconversion of Photochlorophyllide in the *y-1* Mutant of *Chlamydomonas reinhardtii*. WEI-YEH WANG

1107 Phototropic Responses of *Vaucheria geminata* to Intermittent Blue Light Stimuli. HIRONAO KATAOKA

1111 Temperature Regulation of Growth and Endogenous Abscisic Acid-like Content of *Tulipa gesneriana* L. LOUIS H. AUNG AND AUGUST A. DE HERTOGH

1117 Titration of Isolated Cell Walls of *Lemna minor* L. CLAUDINE MORVAN, MAURICE DEMARTY, AND MICHEL THELLIER

1123 Hydrolytic Enzymes in the Central Vacuole of Plant Cells. THOMAS BOLLER AND HANS KENDE

1133 Role of Polygalacturonase in Bean Leaf Abscission. RICHARD K. BERGER AND PHILIP D. REID

1138 Inactivation of Hydrogenase in Cell-free Extracts and Whole Cells of *Chlamydomonas reinhardi* by Oxygen. DAVID L. ERBES, DAN KING, AND MARTIN GIBBS

1143 Estimation of Potassium Recirculation in Tomato Plants by Comparison of the Rates of Potassium and Calcium Accumulation in the Tops with Their Fluxes in the Xylem Stream. MICHAEL J. ARMSTRONG AND ERNEST A. KIRKBY

1149 *Helminthosporium maydis* Race T Toxin Induces Leakage of NAD^+ from T Cytoplasm Corn Mitochondria. DAVID E. MATTHEWS, PETER GREGORY, AND VERNON E. GRACEN

1154 Disappearance of Porphobilinogen Deaminase Activity in Leaves Before the Onset of Senescence. ROSALIA B. FRYDMAN AND BENJAMIN FRYDMAN

1158 β-1,3-Glucan in Developing Cotton Fibers. Structure, Localization, and Relationship of Synthesis to That of Secondary Wall Cellulose. DAVID MALTBY, NICHOLAS C. CARPITA, DAVID MONTEZINOS, CARL KULOW, AND DEBORAH P. DELMER

1165 Carbohydrate Levels and Photoassimilate Export from Leaves of *Phaseolus vulgaris* Exposed to Excess Cobalt, Nickel, and Zinc. ANANDA B. SAMARAKOON AND WILFRIED E. RAUSER

1170 Callose Deposition and Photoassimilate Export in *Phaseolus vulgaris* Exposed to Excess Cobalt, Nickel, and Zinc. CAROL A. PETERSON AND WILFRIED E. RAUSER

1175 Stickiness to Glass. Circadian Changes in the Cell Surface of *Chlamydomonas reinhardi*. SUSAN C. STRALEY AND VICTOR G. BRUCE

1182 Characterization of the Light-induced Transient States of the Chlorophyll Proteins 668 and 743 from *Atriplex rosea*. WILLIAM G. HAGAR AND TETSUO HIYAMA

1187 Analysis of the Distribution of Potassium-stimulated Adenosine Triphosphatase Activity in Soybean Root. ROBERT L. TRAVIS, SHU GENG, AND ROBERT L. BERKOWITZ
1191 An Electron Microscope Comparison of Plasma Membrane Vesicles from Meristematic and Mature Soybean Root Tissue. ROBERT L. BERKOWITZ AND ROBERT L. TRAVIS
1198 Developmental Expression of Genetically Defined Peptidases in Maize. LILA O. VODKIN AND JOHN G. SCANDALIOS
1205 Influence of Light and Ambient Carbon Dioxide Concentration on Nitrate Assimilation by Intact Barley Seedlings. MUHAMMAD ASLAM, RAY C. HUFFAKER, D. WILLIAM RAINS, AND K. PRASAD RAO
1210 Are the *in Vitro* Effects of Disalicylidenepropanediamine Mediated by Salicylaldehyde? CLIVE R. IRELAND AND GERALD K. GOLDWIN
1212 Isolation of Protoplasts and Chloroplasts from Flag Leaves of *Triticum aestivum* L. RICHARD C. LEEGOOD AND DAVID A. WALKER
1215 Lithium Inhibition of the Thigmomorphogenetic Response in *Bryonia dioica*. NICOLE BOYER, BRIGITTE CHAPELLE, AND THOMAS GASPAR
1217 Inhibition of Polar Indole-3-acetic Acid Transport by Cycloheximide. JOSEPH RIOV AND RAPHAEL GOREN
1220 Electron Spin Resonance of 2,2,6,6-Tetramethylpiperidine-1-Oxyl (TEMPO)-labeled Plant Leaves. R. LOWELL FEY, MILTON WORKMAN, HARRY MARCELLOS, AND MICHAEL J. BURKE
i Title page
iii Volume Contents
xi Author Index
xv Subject Index

Author Index

A

Abel, Kay M., 650
Abou-Khalil, Samir, 635
Adams, Douglas O., 589
Akazawa, Takashi, 336
Albersheim, Peter, 425
Allard-Turner, Victoria, 1072
Aloni, Roni, 609
Altman, Arie, 280
Alves, Leo M., 359
Alvim, Ronald, 774
Anderson, James D., 100, 931
Andrews, T. John, 650
Armstrong, Donald J., 35
Armstrong, Michael J., 1143
Armstrong, Toni A., 341
Arntzen, Charles J., 237
Aslam, Muhammad, 1205
Atkins, Craig A., 1076, 1082
Aung, Louis H., 1111
Aynardi, J. Marc, 440

B

Balke, Nelson E., 42, 48, 53
Barros, Raimundo S., 774
Basha, S. Madanapalli Mahaboob, 301
Bassham, James A., 105, 109
Baur, J. R., 882
Beasley, Charles A., 57
Beevers, Harry, 687
Bendich, Arnold J., 660
Benedict, C. Roy, 852
Bennett, Jesse H., 692
Ben-Tal, Yosel, 474
Bergamasco, Ferruccio, 294
Berger, Richard K., 1133
Berkowitz, Robert L., 1187, 1191
Berrie, Alex M. M., 61, 758
Bethlenfalvay, Gabor J., 213, 816
Beyer, Elmo M., Jr., 169
Bloom, Arnold J., 749
Bogorad, Lawrence, 436
Boller, Thomas, 1123
Bomsel, Jean-Loup, 857, 866
Boniolo, Antonio, 294
Booz, Martha L., 573
Borstlap, Adrianus C., 244
Bowden-Bonnett, Linda, 769
Boyer, Nicole, 1215
Bravdo, Ben-Ami, 399
Bressan, Ray A., 924
Briggs, Winslow R., 218, 1062
Bright, Simon W. J., 586
Brooks, James L., 93
Brown, John C., 692
Brown, Robert G., 557
Bruce, Victor G., 1175
Bryant, Stephen D., 696
Bryce, Warren H., 312
Bukovac, Martin J., 129
Buller, David, 758
Burke, John J., 237
Burke, Michael J., 1220
Burnell, James N., 1095
Burrows, William J., 35

C

Calvayrac, Régis, 857, 866
Canvin, David, 399
Carpita, Nicholas C., 1158
Cavalieri, Anthony J., 531
Chabot, Brian F., 542, 1033
Chabot, Jean F., 542
Chang, Chong W., 973
Chang, Shu-Ray, 57
Chapelle, Brigitte, 1215
Chapman, David J., 567, 669
Chapman, Elza, 363
Cheeseman, John M., 1, 255
Chen, Chin-Yu, 704
Chen, Paul, 627
Cherry, Joe H., 79, 87
Cheruel, Jacqueline, 621
Cheung, Chi P., 146
Chiu, Jane Y., 409
Ch'ng, Ai L., 578
Choinski, John S., Jr., 1068
Christeller, John T., 450
Christiansen, Meryl N., 692
Cleland, Robert E., 898
Cockburn, William, 1029
Conn, Eric E., 1022
Corcuera, Luis J., 9, 14
Coudron, Carol A., 536
Cowles, Joe R., 402
Craig, Stewart, 821
Creach, Elisabeth, 788
Cress, Dean, 718

D

Dainty, Jack, 709
Dalling, Michael J., 346
Davenport, Thomas L., 152
Davey, Joanne E., 873
Davis, Bill D., 1010
Davis, Robert F., 940
DeCaleya, Roberto, 195
De Hertogh, August A., 1111
Deitzer, Gerald F., 481
de la Roche, A. Ian, 5
Delmer, Deborah P., 1158
DeLuca, Vincenzo, 903
Demarty, Maurice, 283, 1117
Dennis, David T., 903
Dharmananda, Subhuti, 1049
Dickinson, David B., 416
Diner, Bruce A., 20, 26, 30
Dockerty, Alex, 468
Don, Ronald, 758
Douglas, Carl, 989
Droppa, Magdolna, 778
Dubertret, Guy, 866
Duke, Stanley H., 956
Duval, Yves, 283

E

Earle, Elizabeth D., 806
Edgington, Lloyd V., 367
Edmunds, Leland N., Jr., 495
Edwards, Gerald E., 738, 821
Egli, Margaret A., 57
Elliott, Daphne C., 264, 269, 274, 277
Elliott, William M., 833
Engelsma, Gerrit, 765
Enns, Russel K., 206
Epstein, Ephraim, 1044
Erbes, David L., 1138
Erez, Amnon, 1044
Esashi, Yohji, 1039
Espelie, Karl E., 433

F

Faludi-Dániel, Ágnes, 778
Feldman, Jerry F., 1049
Ferguson, Jane E., 416
Ferrier, Jack M., 709
Fey, R. Lowell, 1220
Filner, Philip, 924
Finkle, Bernard J., 598
Fisher, Robert W., 984
Forde, Brian G., 67
Fork, David C., 524
Fowke, Larry C., 382
Fowler, David Brian, 627
Foy, Charles D., 692
Franco, Alvilio A., 421
French, C. S., 174
Frenkel, Chaim, 149, 837
Freyssinet, Georges, 908
Frick, Hugh, 979
Fritsch, Hansjörg, 687
Frydman, Benjamin, 1154
Frydman, Rosalia B., 1154

G

Galun, Margalith, 201
Gantt, Elisabeth, 615
Gaspar, Thomas, 1215
Gates, David M., 916
Gauger, John A., 486
Gayler, Kenwyn R., 578
Geng, Shu, 1187
Giaquinta, Robert T., 744, 828
Gibbs, Martin, 1138
Giladi, Israel, 280
Gillam, Ian, 35
Goldwin, Gerald K., 1210
Goren, Raphael, 280, 1217
Gower, Richard A., 548
Grabowski, Joseph, 615
Gracen, Vernon E., 1049
Grebanier, Alice E., 436
Gregory, Peter, 1049
Grodzinski, Bernard, 289
Gronewald, John W., 255
Gross, Kenneth C., 117
Gross, Louis J., 1033
Grushow, Jane, 440
Gusta, Lawrence V., 627

H

Hagar, William G., 1182
Halperin, Walter, 989
Hamel, Kathy, 1082
Hanson, Andrew D., 518
Hanson, John B., 1, 255, 635
Harris, Gary C., 908
Hartley, F. Alexandra, 947
Hartsock, Terry L., 63
Hatch, Marshall D., 821
Heisler, Edward G., 359
Helgeson, John P., 9, 14
Hendrix, Donald L., 936
Henningsen, K. W., 174

Henson, Cynthia A., 956
Herath, H. M. Walter, 406
Herz, Jeffrey M., 324
Hiller, Larry K., 1055
Hirai, Masashi, 715
Hiyama, Tetsuo, 1182
Hobson, Louis A., 947
Hodges, Thomas K., 42, 48, 53
Hojima, Yoshio, 562
Horváth, Gábor, 778
Hsu, Francis C., 552
Huang, Anthony H. C., 531
Huber, Steven C., 754
Huffaker, Ray C., 1205

I

Ikuma, Hiroshi, 704
Imber, Dorot, 1044
Ireland, Clive R., 1210
Ireland, Robert J., 903
Izawa, Seikichi, 133

J

Jabben, Merten, 481
Janes, Harry W., 149, 837
Jaworski, Andrew Z., 940
Jaworski, Ernest G., 341
Jeblick, Wolfgang, 455
Jones, Karen, 793
Jordan, Wayne R., 152
Jullien, Marc, 621
Jung, Dennis W., 591
Jurik, Thomas W., 542

K

Kaiser, Ivan I., 511
Kaiser, Werner, M., 105, 109, 605
Kalan, Edwin B., 359
Kataoka, Hironao, 1107
Kauss, Heinrich, 455
Kelly, William C., 1055
Kelman, Arthur, 14
Kende, Hans, 507, 639, 1123
Kendrick, Richard E., 503
Ketcham, Dawn E., 947
Khan, Anwar A., 126
Kiessig, Richard S., 324
Kimmins, Warwick C., 557
King, Dan, 1138
King, Earl E., 260
King, Roderick W., 643
Kirkby, Ernest A., 1143
Kissinger, John C., 359
Klein, Isaac, 474
Klein, Richard M., 114
Koch, David W., 878
Koehler, Don E., 677
Kohel, Russel J., 852
Kojima, Mineo, 1022
Kokkinakis, Demetri M., 93
Kolattukudy, P. E., 433
Konze, Jörg R., 507
Ku, S. B., 738
Kulow, Carl, 1158

L

Laasch, Norbert, 605
Laing, William A., 450
Lamppa, Gayle K., 660
Lane, Forrest E., 696
Lark, Karl G., 718
Larsson, Christer, 887
Laties, George G., 591
Laval-Martin, Danielle L., 495, 857, 866
Lavee, Shimon, 474
Layzell, David B., 730, 1082
Lea, Peter J., 232
Leaver, Christopher J., 67
LeCureux, Lloyd, 924
Leech, Rachel M., 567
Leegood, Richard C., 1212
Leffler, Harry R., 260
Leggatt, Maureen M., 586
Leonard, Robert T., 183, 191
Leopold, A. Carl, 726
Lester, Bruce R., 79, 87
Lewis, Lowell N., 677
Lieberman, Morris, 811, 931
Lilley, Ross McC., 821
Limberg, Michael, 718
Lin, Willy, 952
Lipschultz, Claudia A., 615
Longstreth, David J., 700
Lord, J. Michael, 769
Lott, John N. A., 307, 847
Lucas, William J., 248, 709
Lurie, Susan, 936
Lystash, John C., 444

M

Mahon, John D., 892
Maltby, David, 1158
Mancinelli, Alberto L., 841
Marcellos, Harry, 1220
Martin, Barry A., 486
Matthews, David E., 1049
McArthur, James A., 218
McClendon, John H., 74
McKenzie, Geoffrey H., 578
McKersie, Bryan D., 802
McNeil, David L., 730, 1076, 1082
Melamed-Harel, Hadassah, 1089
Melcher, Ulrich, 354
Merrett, Michael J., 468
Métraux, Jean-Pierre, 657
Mettler, Irvin J., 183, 191
Michel, Burlyn E., 221
Miernyk, Jan A., 1068
Miflin, Benjamin J., 232, 586
Mishra, Dinabandhu, 318
Misra, Santosh, 793
Mitchell, Cary A., 121
Montague, Michael J., 341
Montezinos, David, 1158
Moore, Thomas S., Jr., 963
Morgan, Page W., 152
Moriwaki, Chiaki, 562
Moriya, Hiroshi, 562
Morris, Roy O., 87
Morvan, Claudine, 709, 1117
Mostert, Elias, 244
Murata, Norio, 524
Murofushi, Noboru, 129
Murphy, Denis J., 328

N

Nasatir, Maimon, 908
Nelsen, Charles E., 518
Nelson, Oliver E., 312
Neyra, Carlos A., 421
Nielsen, Niels C., 174
Niemi, Hannu A., 778
Nissenbaum, Arie, 201
Nobel, Park S., 63, 700
Norris, Robert F., 213
Nott, Robyn, 796

O

Oaks, Ann, 793
Ogawa, Yukiyoshi, 643
Ohyama, Kanji, 382
Okamoto, Kazuo, 336
Okita, Thomas W., 195
Oliver, Robin J., 67
Ormrod, Douglas P., 406
Oro, James, 402
Owens, Lowell D., 683, 811

P

Paau, Alan S., 402
Parker, William, 758
Pate, John S., 730, 1076, 1082
Patra, Hemanta K., 318
Patterson, Joseph M., III, 359
Peiser, Galen D., 142
Pelcher, Lawrence E., 382
Pendleton, John W., 956
Peoples, Timothy R., 878
Pereira, Joao C., 421
Peterson, Carol A., 367, 1170
Phillips, Donald A., 213, 816
Pike, Carl S., 139, 440, 444
Pimpini, Ferdinando, 294
Pizzolato, Thompson Demetrio, 979
Posner, Herbert B., 548
Poulton, Jonathan E., 1022
Powell, Loyd E., 1055
Powell, Robert D., 388
Pratt, Lee H., 680
Priestley, David A., 726

Q

Quail, Peter H., 1062

R

Radin, John W., 57
Rains, D. William, 1205
Raison, John K., 363
Ramina, Angelo, 294, 298
Rao, K. Prasad, 1205
Rappaport, Lawrence, 195
Rauser, Wilfried E., 1165, 1170
Rebeiz, Constantin A., 227
Reed, Malcolm Leonard, 216
Reger, Bonnie J., 209
Reid, Philip D., 1133
Reinhold, Leonora, 1089
Rhodes, Ashby M., 416
Richardson, Alice E., 139, 440
Ridley, Jeanette, 392
Ridley, Stuart M., 392
Riov, Joseph, 1217
Robitaille, Henry A., 121
Rogers, Cynthia A., 388
Roth-Bejerano, Nurit, 503
Russell, David B., 627
Ryan, Clarence A., 562
Rychter, Anna, 149, 837

S

Sakano, Katsuhiro, 583
Samarakoon, Ananda B., 1165
Sasakawa, Hideo, 1098
Sasaki, Kimiko, 1016
Sato, Naoki, 524
Satoh, Shigeru, 1039
Saunders, Peter F., 774
Scandalios, John G., 1198
Schaefer, Angelika, 382
Schiff, Jerome A., 908
Schilling, Norbert, 639
Schmitt, Mark R., 738
Schmitz, Klaus, 995, 1003

Schnoes, Heinrich K., 9
Schrader, Larry E., 956
Servaites, Jerome C., 956
Shargool, Peter D., 409
Sharpe, Peter J. H., 388
Sherrard, Joseph H., 346
Shomer-Ilan, Adiva, 201
Showalter, Allan M., 444
Shrift, Alex, 1095
Shropshire, W., Jr., 984
Shuch, David J., 495
Siegel, Ned R., 206
Siminovitch, David, 722
Simpson, Ellen E., 669, 674
Skoog, Folke, 35
Smillie, Robert M., 174, 796
Smith, Barry B., 227
Smith, Richard C., 163
Spalding, Martin H., 738
Spanswick, Roger M., 806
Sparace, Salvatore A., 963
Spitzer, Ernest, 847
Srivastava, Lalit M., 995, 1003
Steinback, Katherine E., 237, 436
Sternberg, Leonel O., 1029
Stewart, Robert N., 931
Stewart, Robert R. C., 61
Stone, Harry J., 680
Storey, Richard, 156
Stout, Darryl G., 627
Straley, Susan C., 1175
Streeter, John G., 478
Struxness, Leslie A., 35
Stumpf, Paul K., 328
Sugita, Mamoru, 1016
Suhadolnik, Robert J., 146
Surdin-Kerjan, Yolande, 621
Sutton, William D., 450
Sweeney, Beatrice M., 324

T

Taiz, Lincoln, 657
Takahashi, Nobutaka, 129
Tal, Moshe, 1044
Tanimoto, Eugene, 989
Tao, Kar-Ling, 126
Tener, Gordon M., 35
Tenhunen, John D., 916
Tepfer, Mark, 898
Thayer, Susan S., 1022
Thellier, Michel, 283, 1117
Thompson, John E., 802
Thomson, Klaus S., 455
Thomson, Marta, 455
Ting, Irwin P., 1029
Tolbert, N. Edward, 486
Travis, Robert L., 573, 1187, 1191
Trelease, Richard N., 1068
Tsukada, Yoshiya, 1039
Tully, Raymond E., 518
Tyree, Melvin T., 367

U

Ulrich, Jane M., 598
Un, Hyong, 444
Upper, Christen D., 9, 14
Urbach, Wolfgang, 605

V

Van Alfen, Neal K., 1072
van Bel, Aart J. E., 244
Vanderhoef, Larry N., 1062
van Staden, Johannes, 873
Vick, Brady A., 490
Vodkin, Lila O., 1198
Vogelzang, Robert D., 956
Vollmer, Catherine M., 307, 847
von Wettstein, Diter, 174

W

Waisel, Yoav, 201
Wakabayashi, Susumu, 1039
Walker, David A., 1212
Walker, Griffin H., 133
Wallner, Stephen J., 117
Wallsgrove, Roger M., 232
Walsh, Lyle, 841
Walton, Jonathan D., 806
Wang, Shiow Y., 811
Wang, Wei-yeh, 1102
Weber, James A., 916
Weinstein, Larry, 425
Weiss, Ellen R., 440
Wildner, Günter F., 887
Williams, John P., 669, 674
Wilson, Lloyd G., 924
Withers, Lyndsey A., 460
Wollman, Francis-André, 20, 26, 375
Wong, William W., 852
Woo, K. C., 783
Woodward, Michael D., 9, 14
Workman, Milton, 1220
Wright, Lesley C., 363
Wyn Jones, R. Gareth, 156

Y

Yamamoto, Yukio, 1098
Yang, Shang Fa, 142, 589
Yates, Ida E., 209
Yentur, Semahat, 121
Yocum, Conrad S., 916
Yoder, Olen C., 806
Yoshida, Kouichi, 1016
Young, Patricia A., 511
Yu, Kenneth S., 121
Yu, Yeong-biau, 589
Yuda, Eiji, 129

Z

Zimmerman, Burke K., 615
Zimmerman, Don C., 490, 536

Subject Index

A

Abscisic acid (ABA)
  ethylene evolution and, 1044
  in developing bean seeds, 552
  indoleacetic acid metabolism and, 1044
  -induced callus formation, ethylene and, 280
  -like content of tulip, temperature regulation, 1111
  oat dormancy and, 758
  willow dormancy and, 774
Abscission
  polygalacturonase and, in bean leaf, 1133
  water stress-induced, kinetin and GA_3 movement in cotton leaf petioles during, 152
Abscission zones, kidney bean, ethylene effect on plasma membrane density, 677
Absorbance change, 515 nm, of intact corn chloroplasts, 778
Acid (*see also* specific acid)
  -induced cell wall loosening in *Valonia* and oat coleoptiles, 898
Adenosine triphosphatase
  membrane, role in phloem loading of sucrose, 744
  oat root plasma membrane, diethylstilbestrol inhibition of, 48, 53
  soybean root plasma membrane, 573, 1187
  tobacco mesophyll and epidermis, 936
Adenosine triphosphate
  citrate lyase, from castor bean endosperm, 687
  levels
    HMT toxin and, 806
    in *Lemna*, 548
S-Adenosylmethionine, ethylene synthesis and, 507
Agave deserti stomates, environmental influences, 63
Aging
  Amaranthus cotyledons, effect on betacyanin assay for cytokinins, 274
  soybean seed, lipid oxidation during, 726
Agrobacterium tumefaciens, binding to plant cells, 382
L-Alanine, escape from xylem vessels, 244
Aleurone cells, wheat, α-amylase precursor, 195
Alfalfa
  seedlings, SO_2-injured, ethylene and ethane production, 142
  xylem, vascular disruption, 1072
Alga
  blue-green
    membrane lipids and photosynthesis, 524
    phycobilisomes from, 615
  chloroplast, glutamine metabolism, 578
  metabolism, daylength and, 947
  red, phycobilisomes from, 615
Alkaline band formation in *Chara corallina*, 248
Allantoic acid, soybean, 478
Allantoin, soybean, 478
Amaranthus bioassay for cytokinin, 264, 269, 274, 277
Ambimobility of xenobiotics, 367
Amino acid
  escape from xylem vessels, 244
  levels in carrot cell suspension, 586
  molarities in corn leaf and plastid, 567
  uptake in asparagus mesophyll cells, 621
Amino compounds, xylem-borne, uptake and utilization by legume, 1076
1-Aminocyclopropane-1-carboxylic acid, ethylene production and, in mung bean hypocotyl, 589
Amomum aromaticum leaf, enzyme activity during senescence, 318
Amylase formation in rice seed epithelium, 336
α-Amylase precursor in wheat aleurone cells, 195
Anthocyanin synthesis, photocontrol of, 841
Apple, ethylene production, 811, 931
Araban, beet, *Bacillus subtilis* grown on, 425
Arachis hypogaea leaf, enzyme activity during senescence, 318
Arginine decarboxylase, carrot cells, 341
Artichoke (*see also* Jerusalem artichoke)
  tuber, membrane changes in dormancy, 363
Arundinella hirta
  photosynthetic enzyme distribution, 209
  specialized parenchyma cells, 209
Asparagus mesophyll cells, amino acid uptake, 621
Aspartate kinase isoenzyme levels, 586
Aspartokinase, lysine-sensitive, repression in carrot, 583
Aspergillus, subterminal polygalacturonase, 74
Astragalus
  cysteinyl-tRNA synthetase, 1095
  tRNA, 511
Atriplex patula leaf anatomy, salinity and, 700
Atriplex rosea, light-induced transients of chlorophyll proteins 668 and 743, 1182
Atriplex spongiosa, salt tolerance, 156
Auxin
  differentiation of primary phloem fibers, 609
  -induced ethylene production, regulation in mung bean hypocotyls, 589
  ^{86}rubidium uptake and, 139
  transport, glyphosate and, 882
Axes, soybean embryonic, germinating, purine nucleotide metabolism, 100

B

Bacillus subtilis grown on beet araban, 425
Barley
  chloroplast
    carotenoid synthesis and inhibition, 392
    magnesium inhibition of photosynthesis, 754
    mutant, thylakoid membrane composition and function, 174
  leaf
    enzyme activity during senescence, 318
    phytochrome pelletability, 503
    proline, translocation, and water stress in, 518
  light-harvesting complex, 237
  San 9789 effect on photomorphogenic responses, 481
  seedling, nitrate assimilation, 1205
Bean (*see also* Castor bean; Kidney bean; Mung bean; Soybean)
  bentazon and nitrogen-fixing capability, 213
  cytokinin metabolism, 298
  cytokinin translocation, 294
  glycoprotein, 557
  leaf
    callose deposition with excess exposure to metals, 1170
    carbon export reduced with metal burdens, 1165
    nitrate reductase activity, 421
    polygalacturonase and abscission, 1133
    salinity and anatomy, 700
  nitrogen assimilation, 421
  root nodule, nitrogenase activity, 421
  seed, developing, ABA in, 552
Beet (*see also* Sugar beet)
  araban, *Bacillus subtilis* grown on, 425
Bentazon, nitrogen-fixing capability and, 213
1,4-Benzoxazin-3-ones, corn
  identification by gas-liquid chromatography and mass spectrometry, 9
  quantitation by gas-liquid chromatography, 14
Benzyladenine (BA)
  action on flowering of *Pharbitis nil*, 643
  -dependent response in cytokinin bioassay, 269
[8-^{14}C]Benzylaminopurine, bean
  metabolism, 298
  translocation, 294
Betacyanin synthesis
  cytokinin-dependent, 264
  temperature dependence in *Amaranthus* seedlings, 277
  water stress and, 269
Bioluminescence, circadian rhythm reset by vanillic acid in, 324
Black locust tree protoplast, freezing survival, 722
Boerhaavia diffusa leaf, enzyme activity during senescence, 318
Borate exchanges of *Lemna minor*, 283
Bovine serum albumin effect on cell cultures, 206
Bryonia dioica, lithium inhibition of thigmomorphogenetic response, 1215
Bundle sheath cells
  photosynthetic electron transport, 133
  photosynthetic enzyme distribution, 209
Bundle sheath protoplasts, C_4 plant, chloroplasts from, 821

C

Cabbage seedling, anthocyanin synthesis, 841
Calcium in globoid crystals of cucumber cotyledon protein bodies, 847
Callose deposition in bean seedlings exposed to excess metal, 1170
Callus
  cells, in postclimacteric apple, ethylene production by, 811
  formation in orange, ABA-induced, 280
Carbohydrate levels in bean leaves exposed to excess metals, 1165

Carbon
  C_3 pathway, ^{14}C-labeling evidence for, 650
  C_4 plants, chloroplasts from protoplasts, 821
  -energy source, soybean cell variants using maltose as, 718
  export, reduced with metal burdens, 1165
  isotopes
    stable, enzymic fractionation, 852
    water regime effect on composition in lichens, 201
  metabolism in seagrasses, 650
  transport in nodulated legume, 730
Carbon dioxide
  assimilation, role of potassium in, 878
  enzymic fractionation of stable carbon isotopes, 852
  ethylene metabolism and, 169
  fixation
    by lupin root nodules, 450
    glycidate and, 887
    postillumination, in corn, 788
  internal concentration, stomatal behavior and, in CAM plants, 1029
  nitrate assimilation and, 1205
  photorespiration and, 399
  wheat leaf affinity for, 916
Carbonate dehydratase in leaves, 216
Carotenoid synthesis, location in barley chloroplast, 392
Carrot
  cells
    amino acid levels, 586
    polyamine metabolism, 341
  clonal plantlet, freeze preservation of, 460
  embryo, freeze preservation of, 460
  repression of aspartokinase, 583
  seedstalk elongation, temperature and GA effect on, 1055
Casparian band, suberin from, in sorghum seedlings, 433
Castor bean
  endosperm
    ATP citrate lyase, 687
    mRNA, 769
  leaf, pyruvate kinase isoenzymes, 903
  mitochondria, phospholipid metabolism, 963
Catabolism, glucose, pathway, 450
Caulerpa simpliciuscula chloroplast, glutamine metabolism, 578
Cell (*see also* specific type of cell)
  carrot embryogenic, polyamine metabolism, 341
  soybean, glutamate synthesis, 409
Cell potential, dependence on external potassium in corn roots, 1
Cell wall
  acid-induced loosening in *Valonia* and oat coleoptiles, 898
  -bound hydroxyproline content, phytochrome control of, in pea epicotyls, 444
  Lemna minor, titration, 1117
  polysaccharides, degradation during tomato fruit ripening, 117
  structure, beet, 425
Cereal, cold-acclimating, nuclear magnetic resonance study of water in, 627
Chara corallina
  alkaline band formation, 248
  plasmalemma, voltage noise, 709
Chenopodium album leaf, enzyme activity during senescence, 318
Cherry (*see* Sour cherry)
Chilling injury, photosystem II and, in tomato, 796
Chlamydomonas reinhardi
  circadian changes in cell surface, stickiness to glass as measure of, 1175
  inactivation of hydrogenase, 1138
Chlamydomonas reinhardtii, y-1 mutant, photochlorophyllide photoconversion, 1102
Chlorella pyrenoidosa, photosystem II, 20
2-Chloroethylphosphonic acid (Ethephon), thermal decomposition, 474
Chlorophyll
  light and, 692
  precursors, localization, 227
Chlorophyll proteins, 668 and 743, light-induced transient states, 1182
Chloroplast
  barley
    carotenoid synthesis and inhibition, 392
    magnesium inhibition of photosynthesis, 754
    mutant, thylakoid membrane composition and function, 174
  C_4 plant, 821
  Caulerpa simpliciuscula, glutamine metabolism, 578
  corn
    absorbance change, 778
    proteins synthesized by, 436
  cucumber, biogenesis, 227
  Euglena, Cyt *c*-552 biosynthesis, 908
  pea, DNA sequence homologies, 660
  pyruvate kinase isoenzymes, 903
  spinach
    glycidate and CO_2 fixation, 887
    photosynthetic electron transport, 605
    starch metabolism, 105, 109
  wheat, isolation, 1212
Chromosomal protein, nonhistone, transcription and, 1016
Circadian changes in *Chlamydomonas reinhardi* cell surface, stickiness to glass as measure of, 1175
Circadian rhythms
  in *Neurospora*, 1049
  photosynthetic, in *Euglena*, 495
  vanillic acid resets, 324
Citrate uptake by potato mitochondria, 591
Citronella, photosynthetic rate, 406
Citrus (*see* Orange)
Clonal plantlet, carrot, freeze preservation of, 460
Cobalt
  callose deposition with excess exposure, 1170
  carbon export reduced with excess exposure, 1165
Cocklebur seed, alternative respiration system in ethylene-stimulated germination, 1039
Cold-acclimating cereals, nuclear magnetic resonance study of water in, 627
ColE1-kan, plasmid DNA, nonexpression in tobacco, 683
Coleoptile
  corn, glyphosate and auxin transport, 882
  oat
    acid-induced cell wall loosening, 898
    growth, phytochrome control of, 440
    ^{86}rubidium uptake, 139
Coleus phloem fibers, differentiation of, 609
Corn
  1,4-benzoxazin-3-ones
    identification by gas-liquid chromatography and mass spectrometry, 9
    quantitation by gas-liquid chromatography, 14
  bundle sheath cells, photosynthetic electron transport, 133
  chloroplast
    absorbance change, 778
    protein synthesized by, 436
  coleoptile, glyphosate and auxin transport, 882
  development, peptidases and, 1198
  endosperm
    glutamate synthase, 793
    sugar, 416
  leaf
    amino acid molarities, 567
    enzyme activity during senescence, 318
  mesocotyl, red light-induced elongation, 1062
  mesophyll protoplasts, ATP level reduction, 806
  mitochondria, energy-linked sulfate uptake, 635
  plastid, amino acid molarities, 567
  pollen, starch-synthesizing enzymes, 312
  polypeptide synthesis, 354
  postillumination CO_2 fixation, 788
  root
    fusicoccin and washing responses, 255
    glutamate synthase, 793
    phosphate uptake, 952
    potassium dependence of cell potential, 1
    potassium uptake, 952
    release of ^{86}rubidium to xylem, 163
    sodium efflux pump, 940
Cortex tissue, postclimacteric apple, ethylene production by, 811
Cotton
  fiber
    β-1,3-glucan in, 1158
  growth, light and, 692
  hypocotyl, glyphosate and IAA transport, 882
  leaf
    petiole, kinetin and GA_3 movement in, during water stress-induced abscission, 152
    salinity and anatomy, 700
    starch component ratio, 973
  ovule
    fiber development, 57
    nitrate reduction, 57
  seed
    malate synthase in, 1068
    protein development, 255
Cotyledon
  Amaranthus, aging effect on betacyanin assay for cytokinins, 274
  cucumber
    calcium distribution in globoid crystals, 847
    polyunsaturated fatty acid biosynthesis, 328
  pea, α-amylase activity, 1010
  soybean, leucine tRNA isoaccepting species, purification, 79, 87
Crassulacean acid metabolism (CAM) plants (*see also* specific plants)
  environmental influences on open stomates, 63
  intracellular enzyme localization, 738
  salt requirement, 749
  stomatal behavior and internal CO_2 concentration, 1029
Cress root, cell elongation, 114
Crotolaria striata leaf, enzyme activity during

senescence, 318
Crown gall tumorigenesis in Jerusalem artichoke tuber slices, 989
Crown, wheat, nuclear magnetic resonance study of water in, 627
Cryoprotectants in combination, effects on survival of frozen sugarcane cells, 598
Crystal (*see* Globoid crystal)
Cucumber
chloroplast, biogenesis, 227
cotyledon
calcium distribution in globoid crystals, 847
polyunsaturated fatty acid biosynthesis, 328
leaf, ethylene and ethane emission after SO_2 injury, 924
Cucurbita embryo, protein body globoid crystals, 307
Cyanide-insensitive, salicylhydroxamic acid-sensitive seed potentiation, 121
Cyanide-resistant respiration
ethylene and oxygen effect on, 149
in potato, 837
potato stress metabolite production and, 359
Cyanidium caldarium
photosystem II, 20, 26
phycobilisome-PSII energy transfer, 30
thylakoid membrane ultrastructure, 375
Cycloheximide inhibition of IAA transport, 1217
Cysteinyl-tRNA synthetase, *Astragalus* species, 1095
Cytidine deoxyriboside inhibition of plastid replication, 979
Cytochrome
c-552, biosynthesis in *Euglena* chloroplasts, 908
f, light-induced redox reactions, 524
Cytokinin
activity in white lupin, 873
betacyanin assay for, in *Amaranthus*, 274
content of leucine tRNA isoaccepting species, 87
-dependent betacyanin synthesis, 264
distribution in tRNA, 35
metabolism in bean, 298
translocation in *Phaseolus*, 294

D

Dark CO_2 fixation in corn, 788
Dark respiration, algal, daylength and, 947
Datura innoxia, Agrobacterium tumefaciens binding to, 382
Daylength, algal metabolism and, 947
Decomposition, thermal, of 2-chloroethylphosphonic acid, 474
Deoxyribonucleic acid (DNA)
chloroplast, sequence homologies, 660
ColE1-kan plasmid, nonexpression in tobacco, 683
in rhizobia, 402
Dhurrin metabolism, in sorghum seedlings, 1022
3-(3,4-Dichlorophenyl)-1,1-dimethylurea (DCMU)
Euglena adaptation to, 857, 866
Lemna ATP levels and, 548
Diethylamino cellulose, benzoylated, fractionation, 79
Diethylstilbestrol effect on ion fluxes in oat roots, 42
Disalicylidenepropanediamine (DSPD)
effect on photosynthetic electron transport of isolated spinach chloroplasts, 605
salicylaldehyde and, 1210
Dormancy
artichoke tuber membrane changes in, 363
oat, fatty acids, ABA, and, 758
willow, ABA and, 774

E

Electron spin resonance of TEMPO-labeled leaves, 1220
Electron transport, photosynthetic
corn bundle sheath cells, 133
spinach chloroplasts, 605
Eleusine corocana leaf, enzyme activity during senescence, 318
Elongation (*see also* Growth)
carrot seedstalk, temperature and GA effect on, 1055
cress root cell, 114
red light-induced, in corn mesocotyl, 1062
Embryo
carrot, freeze preservation of, 460
Cucurbita, protein body globoid crystals, 307
wheat, germination, UDP-glucose increase during, 146
Endosperm
castor bean
ATP citrate lyase, 687
mRNA, 769
corn
glutamate synthase, 793
starch-synthesizing enzymes, 312
lettuce, strength during germination, 126
sugar, corn, 416
Energy
-carbon source, soybean cell variants using maltose as, 718
-linked sulfate uptake, by corn mitochondria, 635
Enzyme
activity during leaf senescence, 318
Euglena proplastids, 468
hydrolytic, in plant vacuoles, 1123
intracellular localization in CAM, 738
localization in pea protoplasts, 232
peroxisomal, changes in tomato fruit, 486
photosynthetic, distribution in *Arundinella hirta* cells, 209
starch-synthesizing, in corn pollen, 312
Epicotyl, pea
phytochrome control of cell wall-bound hydroxyproline content, 444
phytochrome control of growth, 440
^{86}rubidium uptake, 139
Epidermis, tobacco, ATPase, 936
Epithelium, rice seed, amylase formation, 336
Ethane production by SO_2-injured plants, 142, 924
Ethephon (*see* 2-Chloroethylphosphonic acid)
Ethylene
ABA-induced callus formation and, 280
cyanide-resistant respiration effect by, 149
evolution, ABA and, 1044
formation in etiolated pea stem sections, 639
-induced germination, alternative respiration system and, 1039
inhibition, light reversal of, 984
metabolism, ethylene action and, 169
plasma membrane density and, 677
production
auxin-induced, in mung bean hypocotyls, 589
by apple protoplasts, 931
by cell cultures, 811
by SO_2-injured plants, 142, 924
synthesis, *S*-adenosylmethionine and, 507
Etioplast, pyruvate kinase isoenzymes, 903
Euglena
adaptation to DCMU, 857, 866
chloroplast, Cyt *c*-552 biosynthesis, 908
circadian photosynthetic rhythms, 495
proplastids, enzymes, 468
Excretion, algal, daylength and, 947

F

Fatty acid
cyclic, synthesis, 490
growth temperature and, 524
incorporation into major glycerolipids in *Vicia faba* leaves, 674
-induced inhibition of lettuce seed germination, 61
oat dormancy and, 758
polyunsaturated, biosynthesis, 328
Fern spore germination, photocontrol of, 704, 984
Fiber development in cotton ovules, 57
Filipin, phytochrome pelletability and, 503
flacca (*see* Tomato)
Flash-induced 515 nanometer absorbance change of intact chloroplasts, 778
Flaxseed synthesis of cyclic fatty acids, 490
Flower
morning glory, ethylene synthesis, 507
Pharbitis nil, benzyladenine action on, 643
Formate metabolism in sugar beet leaf, 289
Freeze preservation of somatic embryos and clonal plantlets of carrot, 460
Freezing survival, black locust tree protoplasts, 722
Freezing tolerance, wheat seedling, linolenic acid and, 5
Fruit
loquat, sorbitol-6-phosphate dehydrogenase, 715
sour cherry, isolation of GA_{32}, 129
tomato
ribulose-1,5-bisphosphate carboxylase/oxygenase changes in, 486
ripening, cell wall polysaccharide degradation during, 117
Fusicoccin
corn root tissue response to, 255
-dependent response in cytokinin bioassay, 269

G

Galactolipid synthesis in *Vicia faba* leaves, 669, 674
Galactosyl transferase activity sites in *Vicia faba* leaves, 669
Geotropism, pea epicotyl, red light and, 218
Germination
ethylene-induced, alternative respiration system and, 1039
fern spore, photocontrol of, 704, 984
lettuce endosperm strength during, 126
lettuce seed, temperature effect on fatty acid-induced inhibition of, 61
wheat seed
nonhistone chromosomal proteins and transcription during, 1016
UDP-glucose increase during, 146

Gibberellin
  A_3, movement in leaf petioles during water stress-induced abscission, 152
  A_{32}, isolation from sour cherry, 129
  differentiation of primary phloem fibers, 609
  temperature and, in carrot seedstalk elongation, 1055
Globoid crystal
  calcium distribution, 847
  composition, 307
β-1,3-Glucan, in cotton fibers, 1158
Glucose catabolism pathway, 450
ADP-Glucose formation by chloroplast extract, 109
[^{14}C]Glucose studies of CO_2 fixation by lupin root nodules, 450
UDP-Glucose increase during wheat embryo germination, 146
Glutamate synthase in corn endosperm and roots, 793
Glutamate synthesis, soybean cell, 409
Glutamine metabolism, algal chloroplast, 578
Glycerolipid, fatty acid incorporation into, in *Vicia faba* leaves, 674
Glycidate, CO_2 fixation and, 887
Glycoprotein, bean, 557
Glyphosate
  auxin transport and, 882
  IAA transport and, 882
Gonyaulax polyedra, circadian rhythm in bioluminescence reset by vanillic acid, 324
Grana-rich and grana-deficient chloroplast mutants of barley, thylakoid membranes, 174
Greening, corn, proteins appearing during, 436
Growth (*see also* Elongation)
  tulip, temperature regulation, 1111
Growth rate, hysteresis in, 1089
Growth temperature, effect on membrane lipids and photosynthesis, 524

H

Hedera canariensis leaf, carbonate dehydratase, 216
Helminthosporium maydis race T toxin
  ATP level reduction by, 806
  inhibition due to NAD^+ leakage, 1149
Herbicide (*see also* specific herbicides)
  photomorphogenic responses and, 481
Hibiscus micranthus leaf, enzyme activity during senescence, 318
Hill reaction inhibitor, bentazon as, 213
Hormonal imbalance, abnormal stomatal behavior and, in wilty tomato mutant, 1044
Hormone wound, traumatin, identification of, 536
Hydrogen production, hydrogenase activity and, in peas, 816
Hydrogenase activity, H_2 production in peas and, 816
Hydrogenase inactivation, 1138
Hydrolytic enzymes in plant vacuoles, 1123
Hydroxymethyltransferase serine from spinach leaf, 783
Hydroxyproline, cell wall-bound, phytochrome control of, in pea epicotyls, 444
N-Hydroxysuccinimide modification, 79
Hygrometer, thermocouple, correcting thermal gradient errors in, 221
Hypocotyl
  cotton, glyphosate and IAA transport, 882
  mung bean, ethylene production, 589
Hysteresis in membrane potential and growth, 1089

I

Indoleacetic acid (IAA)
  glyphosate and, 882
  metabolism, ABA and, 1044
  transport, cycloheximide inhibition of, 1217
Indoleacetic acid oxidase, pea seedling, 696
Ion fluxes, oat root, diethylstilbestrol effect on, 42
Ion transport in isolated tobacco protoplasts, 183, 191
Ionic regulation for cytokinin action, 264
Iron, ferric reduction, light and, 692
Isochrysis galbana metabolism, daylength and, 947
Isoenzyme, pyruvate kinase, in etioplasts and chloroplasts, 903
Isofloridoside-phosphate synthase, activation after osmotic stress, 455

J

Jerusalem artichoke tuber
  crown gall tumorigenesis, 989
  mitochondrial protein synthesis, 67

K

Kidney bean
  abscission zones, ethylene effect on plasma membrane density, 677
  metalloenzyme inhibitor, 562
Kinetin movement in leaf petiole during water stress-induced abscission, 152

L

Leaf
  Atriplex patula, salinity and anatomy, 700
  barley
    phytochrome pelletability, 503
    proline, translocation, and water stress in, 518
  bean
    callose deposition with excess exposure to metals, 1170
    carbon export reduced with metal burdens, 1165
    nitrate reductase activity, 421
    polygalacturonase and abscission, 1133
    salinity and anatomy, 700
  castor bean pyruvate kinase isoenzymes, 903
  corn, amino acid molarities, 567
  cotton
    petiole, kinetin and GA_3 movement in, during water stress-induced abscission, 152
    salinity and anatomy, 700
    starch component ratio, 973
  cucumber, ethylene and ethane emission after SO_2 injury, 924
  Hedera canariensis, carbonate dehydratase, 216
  pea
    control of growth by high irradiance responses, 833
    nitrogen assimilation enzyme distribution, 232
    pyruvate kinase isoenzymes, 903
  pepper, porphobilinogen deaminase in senescence, 1154
  pineapple, hydrolytic enzymes in vacuoles, 1123
  poinsettia, porphobilinogen deaminase in senescence, 1154
  Salvia occidentalis, phenol metabolism, 765
  senescence, enzyme activities during, 318
  sorghum, dhurrin metabolism, 1022
  spinach
    carbonate dehydratase, 216
    proline oxidase, 531
    serine hydroxymethyltransferase, 783
  squash, ethylene and ethane emission after SO_2 injury, 924
  strawberry, photosynthesis in changing light, 542, 1033
  sugar beet, formate metabolism, 289
  sunflower, photorespiration, 399
  TEMPO-labeled, electron spin resonance, 1220
  tomato, chilling and photosystem II, 796
  Tradescantia albiflora, carbonate dehydratase, 216
  Vicia faba, galactolipid synthesis, 669, 674
  wheat
    isolation of protoplasts and chloroplasts, 1212
    net photosynthesis, 916
    nitrate reductase stability, 346
Legume
  nodulated, transport of carbon and nitrogen, 730
  xylem-borne amino compound uptake and utilization, 1076
Lemna minor
  borate exchanges, 283
  pyrimidine metabolism, 979
  titration of cell walls, 1117
Lemna paucicostata 6746, ATP levels, 548
Lemongrass, photosynthetic rate, 406
Lettuce
  endosperm, strength during germination, 126
  seed
    germination, temperature effect on fatty acid-induced inhibition of, 61
    potentiation, 121
Leucine tRNA, isoaccepting species from soybean cotyledons, purification, 79, 87
Lichen, water regime and $^{13}C/^{12}C$ ratios, 201
Light (*see also* Radiation)
  blue, phototropic responses of *Vaucheria geminata* to, 1107
  changing, photosynthesis and, 542, 1033
  cotton growth and, 692
  -dark regulation of starch metabolism in spinach chloroplasts, 105, 109
  -dependent polyunsaturated fatty acid biosynthesis, 328
  energy redistribution, temperature dependence, 524
  ferric iron reduction and, 692
  -harvesting complex in barley, 237
  -induced redox reactions, temperature dependence, 524
  -induced transients of chlorophyll proteins 668 and 743, 1182
  Lemna ATP levels and, 548
  nitrate assimilation and, 1205
  nitrate reductase activity and, 1098
  nitrate uptake and, 1098
  pulsed, phototropic responses, 1107
  red
    -inhibited mesocotyl elongation, 1062
    pea epicotyl geotropism and, 218
  ^{86}rubidium uptake and, 139
  -requiring lettuce seeds, potentiation, 121

reversal of ethylene inhibition, 984
Linkage analysis of bean glycoprotein, 557
Linolenic acid, freezing tolerance and, 5
Lipid
bilayers, sterols in, 802
oxidation, in aged soybean seeds, 726
Synechococcus lividus membrane, growth temperature and, 524
Lithium inhibition of thigmomorphogenetic response, 1215
Loquat fruit, sorbitol-6-phosphate dehydrogenase, 715
Lupin
root nodules, CO_2 fixation, 450
transport of carbon and nitrogen, 730
white
cytokinin activity, 873
organic solute transport, 1082
xylem-borne amino compound uptake and utilization, 1076
Lysine-sensitive aspartokinase repression in carrot, 583

M

Macrocystis integrifolia, long distance transport, 995, 1003
Magnesium
inhibition of photosynthesis, 754
-protoporphyrin monoester, biosynthesis and accumulation, 227
Maize (*see* Corn)
Malate synthase in dry oilseeds, 1068
Maltose, soybean cell variants using, 718
Mathematical analysis of K^+ dependence of root cell potential, 1
Membrane (*see also* Plasma membrane; Thylakoid membrane)
artichoke tuber, changes during dormancy, 363
Membrane lipid, photosynthesis and, in blue-green alga, 524
Membrane potential, hysteresis in, 1089
Mesembryanthemum crystallinum, salt requirement for CAM, 749
Mesocotyl, corn, red light-induced elongation, 1062
Mesophyll
cells
asparagus, amino acid uptake, 621
photosynthetic enzyme distribution, 209
protoplast
C_4 plant, chloroplasts from, 821
corn, ATP level reduction, 806
tobacco, ATPase, 936
Metabolism
algal, daylength and, 947
carbon, in seagrasses, 650
cytokinin, in bean, 298
dhurrin, in sorghum seedlings, 1022
ethylene, 169
formate, in sugar beet leaf, 289
glutamine, algal chloroplast, 578
IAA, ABA effect on, 1044
methionine, in etiolated pea stem sections, 639
nitrogen, low soybean root temperature and, 956
phenol, in *Salvia occidentalis*, 765
phospholipid, in castor bean mitochondria, 963
polyamine, in carrot cells, 341
purine nucleotide, of germinating soybean embryonic axes, 100
pyrimidine, in *Lemna minor*, 979
starch, spinach chloroplasts, 105, 109
Metabolites, potato stress, 359
Metal, excess exposure
callose deposition, 1170
carbon export reduced, 1164
Metalloenzyme inhibitor from kidney beans, 562
Metalloporphyrins, biosynthesis and accumulation, 227
Methionine
ethylene synthesis and, 507
metabolism in etiolated pea stem sections, 639
-rich polypeptide synthesis, 354
Mitochondria
castor bean, phospholipid metabolism, 963
corn, energy-linked sulfate uptake, 635
potato
cyanide-resistant respiration, 149
substrate uptake, 591
Mitochondrial membrane, artichoke tuber, changes in dormancy, 363
Mitochondrial protein synthesis, Jerusalem artichoke tuber, 67
Morning glory flower, ethylene synthesis, 507
Mung bean hypocotyl, ethylene production, 589
Mustard, white, San 9789 effect on photomorphogenesis, 481

N

Nematicide, ambimobility of xenobiotics, 367
Neurospora, circadian rhythms, 1049
Nickel, excess exposure
callose deposition, 1170
carbon export, 1165
Nicotiana plumbaginifolia leaf, enzyme activity during senescence, 318
Nicotinamide adenine dinucleotide (NAD) leakage, HmT toxin inhibition due to, 1149
Nitella, transverse viscoelastic extension, 657
Nitrate assimilation in barley seedling, CO_2, light, and 1205
Nitrate reductase
bean leaf, 421
cotton ovules, 57
light and, 1098
stability, 346
Nitrogen
assimilation
bean plant, 421
distribution of enzymes of, 232
fixation
inhibition of, 450
symbiotic, environmental and genotypic effects on respiration associated with, 892
-fixing capability, bentazon and, 213
metabolism, low soybean root temperature and, 956
proline, translocation, water stress and, in barley leaves, 518
transport in nodulated legume, 730
Nitrogenase activity
bean root nodule, 421
pea root nodules, 816
Nodule
bean root, nitrogenase activity, 421
lupin root, CO_2 fixation, 450
Noise, voltage, *Chara corallina* plasmalemma, 709
Nuclear magnetic resonance, cereal crown water, 627
Nucleotide, purine, metabolism, of germinating soybean embryonic axes, 100

O

Oat
coleoptile
acid-induced cell wall loosening, 898
growth, phytochrome control of, 440
^{86}rubidium uptake, 139
dormancy, fatty acids, ABA, and, 758
root
diethylstilbestrol effect on, 42, 48, 53
potassium absorption, 53
San 9789 effect on photomorphogenic responses, 481
Oenothera drummondii pollen tube, hysteresis in membrane potential and growth, 1089
Oilseed, malate synthase in, 1068
Onoclea sensibilis spore germination, light reversal of ethylene-induced inhibition, 984
Orange, callus formation, ABA-induced, 280
Osmotic regulation, 455
Osmotic stress, synthase activation after, 455
Ouabain effect on Na^+ efflux pump in corn roots, 940
Ovule, cotton
fiber development, 57
nitrate reduction, 57
Oxamyl, ambimobility of xenobiotics, 367
Oxidation, lipid, in aged soybean seeds, 726
12-Oxo-*trans*-10-dodecenoic acid (*see* Traumatin)
Oxygen
cyanide-resistant respiration effected by, 149
ethylene metabolism and, 169
evolution, magnesium inhibition of, 754
inactivation of hydrogenase, in *Chlamydomonas reinhardi*, 1138
wheat leaf affinity for, 916

P

Panicum miliaceum chloroplasts from protoplasts, 821
Parenchyma specialized cells, photosynthetic enzyme distribution, 209
Pea
chloroplast, DNA sequence homologies, 660
cotyledon, α-amylase activity, 1010
epicotyl
phytochrome control of cell wall-bound hydroxyproline content, 444
phytochrome control of growth, 440
red light and geotropism, 218
^{86}rubidium uptake, 139
leaf
control of growth by high irradiance responses, 833
nitrogen assimilation enzyme distribution, 232
porphobilinogen deaminase in senescence, 1154
pyruvate kinase isoenzymes, 903
protoplast, enzyme localization, 232
root nodule, nitrogenase and hydrogenase activity variation, 816
seedling
ethylene metabolism and action, 169
high irradiance responses, 833
IAA oxidase, 696
stem
control of growth by high irradiance responses, 833
ethylene formation, 639

Pea—*continued*
methionine metabolism, 639
symbiotic nitrogen fixation, environmental and genotypic effects on respiration associated with, 892
Peanut protein, two-dimensional electrophoresis, 301
Pelletability, phytochrome, 503
Pennisetum typhoideum leaf, enzyme activity during senescence, 318
Peptidases, corn development and, 1198
Pericarp, tomato, anionic peroxidase, 93
Peroxidase
activity during leaf senescence, 318
anionic, from tomato pericarp, 93
Peroxisomal enzyme (*see* Enzyme)
Peroxisome, sugar beet leaf, formate metabolism, 289
Petal, tulip, hydrolytic enzymes in vacuoles, 1123
Petiole, cotton leaf, kinetin and GA_2 movement in, during water stress-induced abscission, 152
Pharbitis nil, flowering, benzyladenine action on, 643
Phenol metabolism, in *Salvia occidentalis*, 765
Phloem
Coleus, differentiation of, 609
white lupin, organic solute transport, 1082
Phloem loading, of sucrose, 744
Phosphate uptake, corn roots, 952
Phospholipid
bilayers, plant sterols in, 802
synthesis, mitochondrial, 963
Photoassimilate export from bean leaves exposed to excess metals, 1164, 1170
Photochlorophyllide, photoconversion, 1102
Photocontrol
of anthocyanin synthesis, 841
of fern spore germination, 704, 984
Photoconversion, photochlorophyllide, 1102
Photomorphogenic responses, San 9789 and, 481
Photoreactions in corn bundle sheath cells, 133
Photorespiration
CO_2 and, 399
formate metabolism in sugar beet leaf peroxisomes during, 289
Photosynthesis
algal, daylength and, 947
bentazon and, 213
in changing light, 542, 1033
low soybean root temperature and, 956
magnesium inhibition of, 754
membrane lipids and, 524
net, in wheat leaf, 916
salinity and, 700
seagrasses, 650
strawberry leaf, in changing light, 542
Photosynthetic electron transport
corn bundle sheath cells, 133
spinach chloroplasts, disalicylidenepropanediamines effect on, 605
Photosynthetic enzymes, distribution in *Arundinella hirta* cells, 209
Photosynthetic rate
citronella, 406
lemongrass, 406
Photosynthetic rhythm in *Euglena*, 495
Photosystem II
antennae, 20, 26
chilling and, in tomato, 796
Chlorella pyrenoidosa, 20
Cyanidium caldarium, 20, 26
plastoquinone pool, 26
reaction centers, 20, 26, 30
Phototropic response to pulsed light, 1107
Phycobilisome
energy transfer to PSII reaction centers in *Cyanidium caldarium*, 30
from blue-green and red algae, 615
Phytochrome
control
of pea epicotyl cell wall-bound hydroxyproline content, 444
of pea epicotyl growth, 440
destruction, in red-absorbing form, 680
pelletability, 503
Pigment-protein, light-harvesting complex in barley, 237
Pineapple leaf, hydrolytic enzymes in vacuoles, 1123
Plantlet, clonal, carrot, freeze preservation of, 460
Plasmalemma, *Chara corallina*, voltage noise, 709
Plasma membrane
ATPase
diethylstilbestrol inhibition of 48, 53
soybean root, 573, 1187
density, ethylene and, 677
vesicles, from meristematic and mature soybean root tissue, 1191
Plastid
corn, amino acid molarities, 567
pyruvate kinase isoenzymes, 903
replication, inhibition of, 979
Poinsettia leaf, porphobilinogen deaminase in senescence, 1154
Pollen
corn, starch-synthesizing enzymes, 312
Oenothera drummondii, hysteresis in membrane potential and growth, 1089
Polyamine metabolism in carrot cells, 341
Polygalacturonase
abscission and, in bean leaf, 1133
subterminal, 74
Polypeptide, methionine-rich, synthesis, 354
Polyphenoloxidase activity during leaf senescence, 318
Polyphenols, adsorbed by PVP and BSA from cell cultures, 206
Polysaccharides, cell wall, degradation during tomato fruit ripening, 117
Polyvinylpyrrolidine, effect on cell cultures, 206
Porphobilinogen deaminase in senescence, 1154
Potassium
absorption, in oat root by diethylstilbestrol, 53
accumulation, temperature and, in *Vicia faba*, 388
dependence of root cell potential, 1
in CO_2 assimilation, 878
recirculation in tomato plants, 1143
-stimulated ATPase from soybean root plasma membrane, 573, 1187
uptake, corn roots, 952
Potato
ambimobility of xenobiotics, 367
cyanide-resistant respiration, 149, 837
mitochondria
cyanide-resistant respiration, 149
substrate uptake, 591
tuber, sesquiterpenoid stress metabolites, 359
Proline accumulation, water stress-induced
in barley leaves, 518
in spinach leaves, 531
Proline oxidase, in spinach leaves, 531
Proplastid, *Euglena*, enzymes, 468
Protein
chlorophyll, 668 and 743, light-induced transient states, 1182
cotton seed, development of, 255
nonhistone chromosomal, transcription and, 1016
peanut, two-dimensional electrophoresis, 301
-pigment, light-harvesting complex, 237
synthesis, mitochondrial, in Jerusalem artichoke tuber, 67
synthesized by isolated corn plastids, 436
Protein body, cucumber cotyledon, calcium contribution in globoid crystals, 847
Proton transport, role in phloem loading of sucrose, 744
Protoplasts
apple, ethylene production, 931
black locust tree, freezing survival, 722
pea, enzyme localization, 232
tobacco
ColE1-kan plasmid DNA binding, 683
ion transport, 183, 191
wheat, isolation, 1212
Protoporphyrin IX biosynthesis and accumulation, 227
Pyrimidine metabolism in *Lemna minor*, 979
Pyrophosphatase activity during leaf senescence, 318
Pyruvate kinase isoenzymes, in plastids, 903

R

Radiation, reversible effects of green and orange-red on plant cell elongation, 114
Ramalina duriaei, water regime and carbon isotope composition, 201
Raphanus sativus leaf, enzyme activity during senescence, 318
Respiration
alternative system, ethylene-induced germination and, 1039
cyanide-resistant
ethylene and oxygen effect on, 149
in potato, 359, 837
dark, algal, 947
with symbiotic nitrogen fixation in peas, environmental and genotypic effects on, 892
Rhizobia, DNA content, 402
Ribonucleic acid (RNA)
messenger, castor bean endosperm, 769
transfer
Astragalus bisulcatus, 511
cytokinin distribution, 35
leucine, isoaccepting species from soybean cotyledons, purification, 79, 87
Ribonucleosides, cytokinin-active, distribution in tRNA, 35
Ribosome binding of leucine tRNA isoaccepting species, 87
Ribulose 1,5-bisphosphate as CO_2 acceptor, 788
Ribulose-1,5-bisphosphate carboxylase, enzymic fractionation of stable carbon isotopes of CO_2 by, 852
Ribulose-1,5-bisphosphate carboxylase/oxygenase, changes during tomato fruit development and ripening, 486
Rice
leaf, enzyme activity during senescence, 318
seed, amylase formation, 336

seedling, phytochrome and nitrate reductase, 1098
Ripening, tomato fruit
cell wall polysaccharide degradation during, 117
enzyme changes during, 486
Root
bean, nodule, nitrogenase activity, 421
corn
fusicoccin and washing responses, 255
glutamate synthase, 793
phosphate uptake, 952
potassium dependence of cell potential, 1
potassium uptake, 952
release of ^{86}rubidium to xylem, 163
sodium efflux pump, 940
cress, cell elongation, 114
lupin nodules, CO_2 fixation, 450
nodule
bean, nitrogenase activity, 421
lupin, CO_2 fixation, 450
pea, nitrogenase and hydrogenase activity variation, 816
oat
diethylstilbestrol effect on 42, 48, 53
potassium absorption, 53
soybean
low temperature effects on nitrogen metabolism and photosynthesis, 956
plasma membrane ATPase, 573, 1187
plasma membrane vesicles, 1191
RPC-2 purification, 87
^{86}Rubidium
movement to xylem exudate from corn root apex, 163
uptake
auxin and, 139
red light and, 139

S

Saccharomyces fragilis endo-polygalacturonase, 74
Salicylaldehyde, disalicylidenepropanediamine and, 1210
Salicylhydroxamic acid-sensitive lettuce seed potentiation, 121
Salt
accumulated in corn root apex, release to xylem, 163
leaf anatomy and, 700
photosynthesis and, 700
requirement for CAM, 749
succulence and, 700
tolerance, chenopods, 156
Saliva occidentalis leaf, phenol metabolism, 765
San 9789, photomorphogenic responses and, 481
Seagrasses, photosynthesis, 650
Sedum praealtum, intracellular enzyme localization in CAM, 738
Seed
bean, developing, ABA in, 552
cocklebur, alternative respiration system in ehylene-stimulated germination, 1039
cotton, protein development, 255
lettuce
germination, temperature effect on fatty acid-induced inhibition of, 61
potentiation, 121
peanut, two-dimensional electrophoresis of proteins, 301
rice, amylase formation, 336
sour cherry, isolation of GA_{32}, 129
soybean, lipid oxidation during aging, 726
wheat, nonhistone chromosomal proteins and transcription during germination, 1016
white lupin, cytokinin distribution, 873
Seedling
alfalfa, SO_2-injured, ethylene and ethane production, 142
Amaranthus, betacyanin assay for cytokinins, 264, 269, 274, 277
barley, nitrate assimilation, 1205
cabbage, anthocyanin synthesis, 841
pea
cotyledon influence on α-amylase activity, 1010
ethylene metabolism and action, 169
high irradiance responses, 833
IAA oxidase, 696
rice, phytochrome and nitrate reductase, 1098
sorghum
dhurrin metabolism, 1022
suberin from Casparian band, 433
tomato, anthocyanin synthesis, 841
wheat, freezing tolerance, 5
Seedstalk, carrot, elongation, temperature and GA effect on, 1055
Selenomethionine, ethylene synthesis and, 507
leaf, enzyme activity during, 318
porphobilinogen deaminase in, 1154
Serine hydroxymethyltransferase, spinach leaf, 783
Sesquiterpenoid stress metabolites, production by potato tuber, 359
Silver ion effect on ethylene metabolism and action, 169
Sodium efflux pump, ouabain and low temperature effect on, 940
Solute, organic, transport in white lupin, 1082
Sorbitol-6-phosphate dehydrogenase, loquat fruit, 715
Sorghum
leaf, enzyme activity during senescence, 318
seedling
dhurrin metabolism, 1022
suberin from Casparian band, 433
Sour cherry seed, isolation of GA_{32}, 129
Soybean
allantoic acid, 478
allantoin, 478
cell
glutamate synthesis, 409
polyphenols adsorbed from, 206
variants using maltose, 718
cotyledon, leucine tRNA isoaccepting species, purification, 79, 87
embryonic axes, germinating, purine nucleotide metabolism, 100
root
low temperature effects on nitrogen metabolism and photosynthesis, 956
plasma membrane ATPase, 573, 1187
plasma membrane vesicles, 1191
seed, lipid oxidation during aging, 726
ureides, 478
Spinach
chloroplast
glycidate and CO_2 fixation, 887
photosynthetic electron transport, 605
starch metabolism, 105, 109
leaf
carbonate dehydratase, 216
proline oxidase, 531
serine hydroxymethyltransferase, 783
Spore, fern photocontrol of germination, 704, 984
Squash leaf, ethylene and ethane emission after SO_2 injury, 924
Starch
breakdown, enzymic mechanisms in germinating rice seeds, 336
component ratio in cotton leaves, 973
metabolism, spinach chloroplasts, 105, 109
-synthesizing enzymes in corn pollen, 312
Stem, pea
control of growth by high irradiance responses, 833
ethylene formation, 639
methionine metabolism, 639
Steroids, phytochrome pelletability and, 503
Sterols in lipid bilayers, 802
Stickiness to glass, as measure of circadian changes in *Chlamydomonas reinhardi* cell surface, 1175
Stomatal aperture, *Vicia faba*, temperature and, 388
Stomatal behavior
abnormal, hormonal imbalance and, in wilty tomato mutant, 1044
CO_2 concentration and, in CAM plant, 1029
Stomate, *Agave deserti*, environmental influences, 63
Strawberry leaf photosynthesis, in changing light, 542, 1033
Stress (*see also* Water stress)
metabolites, sesquiterpenoid, 359
osmotic, synthase activation after, 455
Suaeda monoica, salt tolerance, 156
Suberin from Casparian band of sorghum seedlings, 433
Substrate uptake by potato mitochondria, 591
Succinate uptake by potato mitochondria, 591
Succulence, salinity and, 700, 749
Sucrose
phloem loading, 744
translocation and storage in sugar beet, 828
Sugar, corn endosperm, 416
Sugar beet
leaf, formate metabolism, 289
sucrose phloem loading, 744
sucrose translocation and storage, 828
Sugarcane, frozen cells, survival effected by cryoprotectants in combination, 598
Sulfate uptake, by corn mitochondria, 635
Sulfur dioxide-injured plants, ethylene and ethane production, 142, 924
Sunflower leaf, photorespiration, 399
Synechococcus lividus, membrane lipids and photosynthesis, 524
Synthase activation after osmotic stress, 455

T

Tabernaemontana coronaria leaf, enzyme activity during senescence, 318
Teloschistes villosus, water regime and carbon isotope composition, 201
Temperature
algal metabolism and, 947
change, cyclic, hysteresis and, 1089
dependence of light-induced redox reactions, 524
effect on fatty acid-induced inhibition of lettuce seed germination, 61
gibberellin and, in carrot seedstalk elongation, 1055
growth, effect on membrane lipids and photosynthesis, 524

Temperature—*continued*
low
artichoke tuber membrane survival, 363
sodium efflux pump and, 940
soybean root, nitrogen metabolism and photosynthesis effected by, 956
regulation of tulip growth and ABA-like content, 1111
-sensitive betacyanin synthesis in *Amaranthus* seedlings, 277
Vicia faba stomatal aperature, K^+ accumulation and, 388
2,2,6,6-Tetramethylpiperidine-1-oxyl (TEMPO)-labeled leaves, electron spin resonance, 1220
Thermal decomposition, 2-chloroethylphosphonic acid, 474
Thermal gradient errors, correcting, in hygrometers, 221
Thigmomorphogenetic response, lithium inhibition of, 1215
Thylakoid membrane
composition and function in mutant barley chloroplast, 174
ultrastructure in *Cyanidium caldarium*, 375
Tobacco
cell, hydrolytic enzymes in vacuoles, 1123
leaf ATPase, 936
mesophyll ATPase, 936
protoplast
ColE1-kan plasmid DNA binding, 683
ion transport, 183, 191
Tolerance (*see also* Freezing tolerance)
salt, of chenopods, 156
Tomato
fruit, ripening
cell wall polysaccharide degradation during, 117
ribulose-1,5-bisphosphate carboxylase/oxygenase changes in, 486
leaf, chilling and photosystem II, 796
pericarp, anionic peroxidase, 93
potassium recirculation, 1143
seedling, anthocyanin synthesis, 841
wilty mutant, abnormal stomatal behavior and hormonal imbalance, 1044
xylem vessels, amino acid escape from, 244
Toxin, *Helminthosporium maydis* race T
ATP level reduction by, 806
inhibition due to NAD^+ leakage, 1149
Tradescantia albiflora leaf, carbonate dehydratase, 216
Transcription, nonhistone chromosomal proteins and, 1016
Translocation, proline accumulation and, in water-stressed barley leaves, 518
Transverse viscoelastic extension, *Nitella*, 657
Traumatin identification, 536
Tree, black locust, protoplast, freezing survival, 722
Triticum (*see also* Wheat)
vulgare, leaf, enzyme activity during senescence, 318
Tuber, artichoke
crown gall tumorigenesis, 989
membrane changes in dormancy, 363
mitochondrial protein synthesis, 67
Tulip
ABA-like content, temperature regulation of, 1111
growth, temperature regulation, 1111
petal, hydrolytic enzymes in vacuoles, 1123
Tumorigenesis, crown gall, in Jerusalem artichoke tuber slices, 989

U

Ureides, soybean, 478

V

Vacuole, hydrolytic enzymes, 1123
Valonia, acid-induced cell wall loosening, 898
Vanillic acid, circadian rhythm reset by, 324
Vascular disruption, susceptibility, 1072
Vaucheria geminata, phototropic responses to pulsed light, 1107
Vesicles, plasma membrane, from meristematic and mature soybean root tissue, 1191
Vicia faba leaf, galactolipid synthesis, 669, 674
Voltage noise, *Chara corallina* plasmalemma, 709

W

Washing, corn root tissue response to, 255
Water
cereal crown, nuclear magnetic resonance, 627
regime, $^{13}C/^{12}C$ ratios and, in lichens, 201
Water stress
betacyanin synthesis and, 269
-induced abscission, kinetin and GA_3 movement in cotton leaf petioles during, 152
proline accumulation proline oxidase and, in spinach leaves, 531
proline accumulation, translocation and, in barley leaves, 518
Water vapor pressure, effect on thermal decomposition of 2-chloroethylphosphonic acid, 474
Wheat
aleurone cells
α-amylase precursor, 195
chloroplast isolation, 1212
crown, nuclear magnetic resonance study of water in, 627
embryo germination, UDP-glucose increase during, 146
leaf
net photosynthesis, 916
nitrate reductase stability, 346
protoplast isolation, 1212
seed germination, nonhistone chromosomal proteins and transcription during, 1016
seedling, freezing tolerance, 5
Wheat germ, cytokinin distribution in tRNA, 35
White mustard (*see* Mustard)
Willow dormancy, ABA and, 774
Wound hormone, traumatin, identification of 536

X

Xenobiotics, ambimobility of 367
Xylem
alfalfa, vascular disruption, 1072
-borne amino compounds, uptake and utilization by legume, 1076
exudate, ^{86}rubidium movement to, from corn root apex, 163
stream, potassium and calcium accumulation, 1143
vessels, tomato, amino acid escape from, 244
white lupin, organic solute transport, 1082

Z

Zein polypeptide synthesis, 354
Zinc, excess exposure
callose deposition, 1170
carbon export, 1165

PLANT PHYSIOLOGY

Published by The American Society of Plant Physiologists

EDITORIAL BOARD

MARTIN GIBBS, *Editor-in-Chief*
JACK DAINTY, *Associate Editor*
PAGE W. MORGAN, *Associate Editor*
OLIVER E. NELSON, *Associate Editor*
ANTHONY SAN PIETRO, *Associate Editor*
JOSEPH E. VARNER, *Associate Editor*
JEROME A. SCHIFF, *Advisory Editor*

T. AKAZAWA
N. AMRHEIN
L. E. ANDERSON
C. J. ARNTZEN
B. AXELROD
R. S. BANDURSKI
C. E. BARR
J. A. BASSHAM
W. D. BAUER
W. M. BECKER
H. BEEVERS
L. BEEVERS
C. R. BENEDICT
E. M. BEYER, JR.
J. BIGGINS
C. C. BLACK, JR.
R. BORCHERT
J. S. BOYER
M. L. BRENNER
M. J. BURKE
B. BURR
R. H. BURRIS
P. CASTELFRANCO
G. R. CHANDRA
M. J. CHRISPEELS
C. F. CLELAND
R. E. CLELAND
D. T. DENNIS
D. B. DICKINSON
D. R. DILLEY
G. E. EDWARDS
E. EPSTEIN
B. ETHERTON
M. L. EVANS
D. B. FISHER
N. M. FREY
M. H. GOLDSMITH
P. R. GORHAM
L. A. HADWIGER
R. H. HAGEMAN
J. B. HANSON
R. W. F. HARDY
F. A. HASKINS
G. H. HEICHEL
J. P. HELGESON
J. A. HELLEBUST
W. S. HILLMAN
T. K. HODGES
R. E. HOLM
A. H. C. HUANG
R. C. HUFFAKER
P. C. JACKSON
W. A. JACKSON
E. G. JAWORSKI
R. L. JONES
W. R. JORDAN
K. W. JOY
P. B. KAUFMAN
H. J. KENDE
E. L. KLEPPER
P. E. KOLATTUKUDY
J. KUC
B. A. LARKINS
G. G. LATIES
C. J. LEAVER
H. R. LEFFLER
R. T. LEONARD
M. LIEBERMAN
W. J. LUCAS
R. J. MANS
M. MAZELIS
J. B. MUDD
T. MURASHIGE
P. S. NOBEL
A. OAKS
W. L. OGREN
C. B. OSMOND
H. K. PRATT
L. H. PRATT
J. PREISS
W. K. PURVES
D. W. RAINS
C. W. ROSS
C. A. RYAN
F. B. SALISBURY
J. SCHEIBE
L. SEQUEIRA
D. SIMINOVITCH
F. K. SKOOG
R. M. SPANSWICK
H. A. STAFFORD
C. R. STEWART
B. B. STOWE
G. A. STROBEL
C. A. SWANSON
B. M. SWEENEY
R. B. TAYLORSON
K. V. THIMANN
R. C. VALENTINE
L. N. VANDERHOEF
D. P. S. VERMA
P. E. WAGGONER
V. WALBOT
D. A. WALKER
D. H. WALLACE
D. C. WALTON
C. A. WEST
H. H. WIEBE
F. WIGHTMAN
S. F. YANG
J. A. D. ZEEVAART
M. H. ZIMMERMANN

Volume 64, Numbers 1-6, Pages 1-1120, 1979

PRINTED BY WAVERLY PRESS
BALTIMORE, MD. 21202

Copyright © 1979 by
The American Society of Plant Physiologists

Volume Contents

Number 1. July

1 Nitrogen Fixation, Nodule Development, and Vegetative Regrowth of Alfalfa (*Medicago sativa* L.) following Harvest. CARROLL P. VANCE, GARY H. HEICHEL, DONALD K. BARNES, JEFF W. BRYAN, AND LOIS E. JOHNSON

9 Rhizoid Differentiation in *Spirogyra*. III. Intracellular Localization of Phytochrome. YOKO NAGATA

13 Respiration in Relation to Adenosine Triphosphate Content during Desiccation and Rehydration of a Desiccation-tolerant and a Desiccation-intolerant Moss. JOAN E. KROCHKO, WILLIAM E. WINNER, AND J. DEREK BEWLEY

18 Theoretical and Experimental Exclusion of Errors in the Determination of the Elasticity and Water Transport Parameters of Plant Cells by the Pressure Probe Technique. ULRICH ZIMMERMANN AND DIETER HÜSKEN

25 Photosynthetic Adaptation of *Solanum dulcamara* L. to Sun and Shade Environments. II. Physiological Characterization of Phenotypic Response to Environment. JOHN M. CLOUGH, RANDALL S. ALBERTE, AND JAMES A. TEERI

31 Subcellular Distribution of Gluconeogenetic Enzymes in Germinating Castor Bean Endosperm. MIKIO NISHIMURA AND HARRY BEEVERS

38 Rapid Degradation and Limited Synthesis of Phospholipids in the Cotyledons of Mung Bean Seedlings. NEIL R. GILKES, ELIOT M. HERMAN, AND MAARTEN J. CHRISPEELS

43 Abscisic Acid Localization and Metabolism in Barley Aleurone Layers. WILLIAM V. DASHEK, BIBHUTI N. SINGH, AND DANIEL C. WALTON

49 Chlorophyll Turnover in *Skeletonema costatum*, a Marine Plankton Diatom. DAVID M. RIPER, THOMAS G. OWENS, AND PAUL G. FALKOWSKI

55 Characterization of the Phosphate-mediated Control of Ethylene Production by *Penicillium digitatum*. AUTAR K. MATTOO, EDO CHALUTZ, JAMES D. ANDERSON, AND MORRIS LIEBERMAN

61 Direct Evidence for a Sugar Transport Mechanism in Isolated Vacuoles. MICHA GUY, LEONORA REINHOLD, AND DORIT MICHAELI

65 Inhibition of Soybean Cell Growth by the Adsorption of *Rhizobium japonicum*. TAKASHI OZAWA AND MASURO YAMAGUCHI

69 Detection and Characterization of Sorbitol Dehydrogenase from Apple Callus Tissue. FAYEK B. NEGM AND WAYNE H. LOESCHER

74 Investigations of Vacuoles Isolated from Tobacco. I. Quantitation of Nicotine. JAMES A. SAUNDERS

79 Guard Cell Starch Concentration Quantitatively Related to Stomatal Aperture. WILLIAM H. OUTLAW, JR., AND JILL MANCHESTER

83 Effect of Temperature on Water and Ion Transport in Soybean and Broccoli Systems. ALBERT H. MARKHART, III, EDWIN L. FISCUS, AUBREY W. NAYLOR, AND PAUL J. KRAMER

88 Content and Vacuole/Extravacuole Distribution of Neutral Sugars, Free Amino Acids, and Anthocyanin in Protoplasts. GEORGE J. WAGNER

94 Partitioning of ^{14}C-Photosynthate, and Long Distance Translocation of Amino Acids in Preflowering and Flowering, Nodulated and Nonnodulated Soybeans. THOMAS L. HOUSLEY, LARRY E. SCHRADER, MARNA MILLER, AND TIMOTHY L. SETTER

99 Regulation of the Photosynthesis Rhythm in *Euglena gracilis*. II. Involvement of Electron Flow through Both Photosystems. THOMAS A. LONERGAN AND MALCOLM L. SARGENT

104 Legume Lectins. I. Immunological Cross-Reactions between the Enzymic Lectin from Mung Beans and Other Well Characterized Legume Lectins. CHARLES N. HANKINS, JUANITA I. KINDINGER, AND LELAND M. SHANNON

108 Effect of Ethanol, Acetaldehyde, Acetic Acid, and Ethylene on Changes in Respiration and Respiratory Metabolites in Potato Tubers. ANNA RYCHTER, HARRY W. JANES, CHEE-KOK CHIN, AND CHAIM FRENKEL

112 Stomatal Response of *Populus* Clones to Light Intensity and Vapor Pressure Deficit. STEPHEN G. PALLARDY AND THEODORE T. KOZLOWSKI

115 Permeability Properties of the Inner Membrane of Mung Bean Mitochondria and Changes during Energization. STEVEN C. HUBER AND DONALD E. MORELAND

120 Toxicity of Anaerobic Metabolites Accumulating in Winter Wheat Seedlings during Ice Encasement. CHRISTOPHER J. ANDREWS AND M. KEITH POMEROY

126 Changes in Chloroplast DNA Levels during Development of Pea (*Pisum sativum*). GAYLE K. LAMPPA AND ARNOLD J. BENDICH

131 Effects of Octylguanidine on Cell Permeability and Other Protoplasmic Properties of *Allium cepa* Epidermal Cells. BEATRIZ E. GÓMEZ-LEPE, OKYOUNG LEE-STADELMANN, JIWAN P. PALTA, AND EDUARD J. STADELMANN

139 Salt-induced Inhibition of Phosphate Transport and Release of Membrane Proteins from Barley Roots. EUGENE V. MAAS, GEN OGATA, AND MARTIN H. FINKEL

144 Phenotypical Temperature Adaptation of Protein Synthesis in Wheat Seedlings. Time Curves for Readaptation. MANFRED WEIDNER AND GABRIELE COMBRINK

150 Separation of Mitochondria from Contaminating Subcellular Structures Utilizing Silica Sol Gradient Centrifugation. CHRISTOPHER JACKSON, JANE E. DENCH, DAVID O. HALL, AND ANTHONY L. MOORE

154 Cell-density-dependent Changes in the Metabolism of Chloronema Cell Cultures. I. Relationship between Cell Density and Enzymic Activities. SHOBHONA SHARMA, RADHESHYAM K. JAYASWAL, AND MAN MOHAN JOHRI

159 Photosynthesis in the Higher Plant *Vicia faba*. V. Role of Malate as a Precursor of the Tricarboxylic Acid Cycle. SAMUEL S. KENT

162 Synchronization of Somatic Embryogenesis in a Carrot Cell Suspension Culture. TATSUHITO FUJIMURA AND ATSUSHI KOMAMINE
i Instructions for Contributors

Number 2. August

165 Correlation of Adenosine Triphosphate Levels in *Chara corallina* with the Activity of the Electrogenic Pump. DAVID W. KEIFER AND ROGER M. SPANSWICK
169 Metabolism of Monoterpenes. Demonstration of (+)-Neomenthyl-β-D-Glucoside as a Major Metabolite of (−)-Menthone in Peppermint (*Mentha piperita*). RODNEY CROTEAU AND CHARLOTT MARTINKUS
176 Conversion of L- and D-Phenylalanine to Phenylacetate via Phenylpyruvate in Sorghum Leaf Extracts. HELEN A. STAFFORD AND LESLIE L. LEWIS
182 Isolation and Oxidative Properties of Intact Mitochondria from the Leaves of *Sedum praealtum*. A Crassulacean Acid Metabolism Plant. GEOFFREY P. ARRON, MARTIN H. SPALDING, AND GERALD E. EDWARDS
187 Subcellular Localization of the Starch Degradative and Biosynthetic Enzymes of Spinach Leaves. THOMAS W. OKITA, ELAINE GREENBERG, DAVID N. KUHN, AND JACK PREISS
193 A Transglucosylase from *Sclerotinia libertiana*. RYOICHI YAMAMOTO AND DONALD J. NEVINS
197 Ultrastructural Changes in the Cell Walls of Ripening Apple and Pear Fruit. RUTH BEN-ARIE, NAOMI KISLEV, AND CHAIM FRENKEL
203 Distribution of a Fatty Acid Cyclase Enzyme System in Plants. BRADY A. VICK AND DON C. ZIMMERMANN
206 Ion Fluxes and Phytochrome in Mung Bean Hypocotyl Segments. I. Fluxes of Potassium. COLIN BROWNLEE AND RICHARD E. KENDRICK
211 Ion Fluxes and Phytochrome in Mung Bean Hypocotyl Segments. II. Fluxes of Chloride, Protons, and Orthophosphate in Apical and Subhook Segments. COLIN BROWNLEE AND RICHARD E. KENDRICK
214 Metabolism of Tritiated Gibberellin A_{20} in Immature Seeds of Dwarf Pea, cv. Meteor. RICHARD C. DURLEY, TAKESHI SASSA, AND RICHARD P. PHARIS
220 Hydrogen Peroxide-mediated Oxidation of Indole-3-acetic Acid by Tomato Peroxidase and Molecular Oxygen. DEMETRI M. KOKKINAKIS AND JAMES L. BROOKS
224 A Constitutive Enzyme System for Glucose Transport by *Chlorella sorokiniana*. ROBERT L. HEATH
228 Enzyme Profiles in Seedling Development and the Effect of Itaconate, an Isocitrate Lyase-directed Reagent. F. R. KHAN AND BRUCE A. MCFADDEN
232 Ribosome-Thylakoid Association in Peas. Influence of Anoxia. RUTH ALSCHER-HERMAN, ANDRÉ T. JAGENDORF, AND REBECCAH GRUMET
236 Nicotine Biosynthetic Enzyme Activities in *Nicotiana tabacum* L. Genotypes with Different Alkaloid Levels. JOSEPH W. SAUNDERS AND LOWELL P. BUSH
241 Freezing Injury and Phospholipid Degradation *in Vivo* in Woody Plant Cells. I. Subcellular Localization of Phospholipase D in Living Bark Tissues of the Black Locust Tree (*Robinia pseudoacacia* L.). SHIZUO YOSHIDA
247 Freezing Injury and Phospholipid Degradation *in Vivo* in Woody Plant Cells. II. Regulatory Effects of Divalent Cations on Activity of Membrane-bound Phospholipase D. SHIZUO YOSHIDA
252 Freezing Injury and Phospholipid Degradation *in Vivo* in Woody Plant Cells. III. Effects of Freezing on Activity of Membrane-bound Phospholipase D in Microsome-enriched Membranes. SHIZUO YOSHIDA
257 Photosynthesis in Grass Species Differing in Carbon Dioxide Fixation Pathways. II. A Search for Species with Intermediate Gas Exchange and Anatomical Characteristics. JACK A. MORGAN AND R. HAROLD BROWN
263 A Possible Mechanism of Ammonium Ion Regulation of Photosynthetic Carbon Flow in Higher Plants. A. HABIB MOHAMED AND A. GNANAM
269 Histochemical Approach to Properties of *Vicia faba* Guard Cell Phosphoenolpyruvate Carboxylase. WILLIAM H. OUTLAW, JR., JILL MANCHESTER, AND CYNTHIA A. DICAMELLI
273 Effects of Certain Herbicides and Their Combinations on Nitrate and Nitrite Reduction. LOWELL A. KLEPPER
276 Energy-linked Adenosine Diphosphate Accumulation by Corn Mitochondria. I. General Characteristics and Effects of Inhibitors. SAMIR ABOU-KHALIL AND JOHN B. HANSON
281 Energy-linked Adenosine Diphosphate Accumulation by Corn Mitochondria. II. Phosphate and Divalent Cation Requirement. SAMIR ABOU-KHALIL AND JOHN B. HANSON
285 Regulation of Photosynthetic Activity in the Primary Leaves of Bean (*Phaseolus vulgaris* L.) by Materials Moving in the Water-conducting System. AVNER CARMI AND DOV KOLLER
289 Influence of Enol Ether Amino Acids, Inhibitors of Ethylene Biosynthesis, on Aminoacyl Transfer RNA Synthetases and Protein Synthesis. AUTAR K. MATTOO, JAMES D. ANDERSON, EDO CHALUTZ, AND MORRIS LIEBERMAN
293 Photosynthetic Enzyme Activities and Localization in *Mollugo verticillata* Populations Differing in the Levels of C_3 and C_4 Cycle Operation. RICHARD T. SAYRE, ROBERT A. KENNEDY, AND DEBORAH J. PRINGNITZ
300 Effects of Substituted Pyridazinones (San 6706, San 9774, San 9785) on Glycerolipids and Their Associated Fatty Acids in the Leaves of *Vicia faba* and *Hordeum vulgare*. MOBASHSHER-UDDIN KHAN, NORA W. LEM, KASHINATH R. CHANDORKAR, AND JOHN P. WILLIAMS
306 Postharvest Variation in Cellulase, Polygalacturonase, and Pectinmethylesterase in Avocado (*Persea americana* Mill, cv. Fuerte) Fruits in Relation to Respiration and Ethylene Production. MARCEL AWAD AND ROY E. YOUNG
309 Nitrogen Assimilation Pathways in Leaf Mesophyll and Bundle Sheath Cells of C_4 Photosynthesis Plants Formulated from Comparative Studies with *Digitaria sanguinalis* (L.) Scop. RANDY MOORE AND CLANTON C. BLACK, JR.

314 Cell Surfaces in Plant-Microorganism Interactions. I. A Structural Investigation of Cell Wall Hydroxyproline-rich Glycoproteins Which Accumulate in Fungus-infected Plants. MARIE-THÉRÈSE ESQUERRÉ-TUGAYÉ AND DEREK T. A. LAMPORT
320 Cell Surfaces in Plant-Microorganism Interactions. II. Evidence for the Accumulation of Hydroxyproline-rich Glycoproteins in the Cell Wall of Diseased Plants as a Defense Mechanism. MARIE-THÉRÈSE ESQUERRÉ-TUGAYÉ, CLAUDE LAFITTE, DOMINIQUE MAZAU, ALAIN TOPPAN, AND ANDRÉ TOUZÉ
327 Phytochrome Radioimmunoassay. ROBERT E. HUNT AND LEE H. PRATT
332 Phytochrome Immunoaffinity Purification. ROBERT E. HUNT AND LEE H. PRATT
337 Enzymic Mechanism of Starch Breakdown in Germinating Rice Seeds. 8. Immunohistochemical Localization of β-Amylase. KAZUO OKAMOTO AND TAKASHI AKAZAWA
341 Bright Light Does Not Immediately Stop the Circadian Clock of *Gonyaulax*. BEATRICE M. SWEENEY
345 Importance to Gas Exchange of Mass Flow of Air through Leaves. WILLIAM DAY AND KEITH J. PARKINSON
347 Effect of Temperature on Respiration of a Mesophilic and a Thermophilic Fungus. A. R. S. PRASAD, C. K. RAMAKRISHNA KURUP, AND RAMESH MAHESHWARI
349 Correction

Number 3. September

351 Changes in Frost Hardiness of Stem Cortical Tissues of *Cornus stolonifera* Michx. after Recovery from Water Stress. LAWRENCE R. PARSONS AND PAUL H. LI
354 Photosynthetic and Photorespiratory Characteristics of Mutants of *Hordeum vulgare* L. BARRY G. MCCASHIN AND DAVID T. CANVIN
361 A Method for Continuous Measurement of Export from a Leaf. DONALD R. GEIGER AND BERNADETTE R. FONDY
366 Cadmium Uptake by *Pinus resinosa* Ait. Pollen and the Effect on Cation Release and Membrane Permeability. RICHARD C. STRICKLAND, WILLIAM R. CHANEY, AND ROBERT J. LAMOREAUX
371 Enzymes of General Phenylpropanoid Metabolism and of Flavonoid Glycoside Biosynthesis in Parsley. Differential Inducibility by Light during the Growth of Cell Suspension Cultures. WERNER HELLER, BARBARA EGIN-BÜHLER, SUSAN E. GARDINER, KARL-HEINZ KNOBLOCH, ULRICH MATERN, JÜRGEN EBEL, AND KLAUS HAHLBROCK
374 Rubidium (Potassium) Uptake by *Arabidopsis*. A Comparison of Uptake by Cells in Suspension Culture and by Roots of Intact Seedlings. L. DAVID POLLEY AND JOHNS W. HOPKINS
379 A Circadian Rhythm in Oxygen Uptake by *Samanea* Pulvini. RUTH L. SATTER, ALEXANDER M. HATCH, AND MARIE K. GILL
382 *In Vivo* Activity, Purification, and Characterization of Shikimate Kinase from Sorghum. JOHN R. BOWEN AND TSUNE KOSUGE
387 Ligand Specificity of a High Affinity Cytokinin-binding Protein. GIDEON M. POLYA AND JANETTE A. BOWMAN
393 Reversal of α,α'-Dipyridyl-induced Porphyrin Synthesis in Etiolated and Greening Red Kidney Bean Leaves. LINDA M. VLCEK AND MERRILL L. GASSMAN
398 Identification of Etioplast Membranes in Fractions from Soybean Hypocotyls. WILLIAM J. HURKMAN, D. JAMES MOORÉ, CHARLES E. BRACKER, AND HILTON H. MOLLENHAUER
404 Chloroplast and Cytoplasmic Enzymes. VIII. Amino Acid Composition of the Pea Leaf Aldolases. LOUISE E. ANDERSON AND ROBERT L. HEINRIKSON
406 Diterpene Biosynthesis in Maize Seedlings in Response to Fungal Infection. JAY E. MELLON AND CHARLES A. WEST
411 Transport of Nitrogen in the Xylem of Soybean Plants. PETER R. MCCLURE AND DANIEL W. ISRAEL
417 Studies of Rapidly Induced Wound Ethylene Synthesis by Excised Sections of Etiolated *Pisum sativum* L., cv. Alaska. IV. Requirement of a Water-soluble, Heat-stable Factor. MIKAL E. SALTVEIT, JR., AND DAVID R. DILLEY
421 Effect of Daylength on the Ability of Salicylic Acid to Induce Flowering in the Long-day Plant *Lemna gibba* G3 and the Short-day Plant *Lemna paucicostata* 6746. CHARLES F. CLELAND AND OSAMU TANAKA
425 Accumulation of Free Proline in Citrus Leaves during Cold Hardening of Young Trees in Controlled Temperature Regimes. GEORGE YELENOSKY
428 Elongation Pathway for α-Linolenic Acid Synthesis in Spinach Leaves. A Reexamination. DENIS J. MURPHY AND P. K. STUMPF
431 Cyanide-insensitive Respiration in Pea Cotyledons. TERRANCE W. JAMES AND MARY S. SPENCER
435 Enhanced Dark Carbon Dioxide Fixation in Maize. Effect of the Oxygen Concentration during Preillumination on $^{14}CO_2$ Uptake and the Intramolecular Labeling Pattern of Malate and Aspartate. ELISABETH CREACH
439 *In Vitro* Stability of Nitrate Reductase from Wheat Leaves. II. Isolation of Factors from Crude Extract Which Affect Stability of Highly Purified Nitrate Reductase. JOSEPH H. SHERRARD, JILLIAN A. KENNEDY, AND MICHAEL J. DALLING
445 Dolichylphosphate-dependent Glycosyl Transfer Reactions in the Endoplasmic Reticulum of Castor Bean Endosperm. KATHLEEN M. MARRIOTT AND WIDMAR TANNER
450 Physiological Control of Exo- and Endoproteolytic Activities in Germinating Wheat and Their Relationship to Storage Protein Hydrolysis. KEN R. PRESTON AND JAMES E. KRUGER
455 Ozone Alteration of Membrane Permeability in *Chlorella*. I. Permeability of Potassium Ion as Measured by ^{86}Rubidium Tracer. ROBERT L. HEATH AND PAULA E. FREDERICK
460 Amino Acids Translocated from Turgid and Water-stressed Barley Leaves. I. Phloem Exudation Studies. RAYMOND E. TULLY AND ANDREW D. HANSON

467 Amino Acids Translocated from Turgid and Water-stressed Barley Leaves. II. Studies with ^{13}N and ^{14}C. ANDREW D. HANSON AND RAYMOND E. TULLY
472 Fatty Acids and Circadian Rhythms in *Phaseolus coccineus*. Effects of Light, Temperature, and Chemicals. GEORGE F. GARDNER AND BRUCE B. STOWE
476 Diurnal Growth Trends, Water Potential, and Osmotic Adjustment of Maize and Sorghum Leaves in the Field. EDMUNDO ACEVEDO, ELIAS FERERES, THEODORE C. HSIAO, AND DELBERT W. HENDERSON
481 Sucrose Compartmentation in the Palisade Parenchyma of *Vicia faba* L. DONALD B. FISHER AND WILLIAM H. OUTLAW, JR.
484 Kinetics of Phosphorus Absorption by Mycorrhizal and Nonmycorrhizal Tomato Roots. WILLIAM A. CRESS, GLYN O. THRONEBERRY, AND DONALD L. LINDSEY
488 A Cuvette Design for Measurement of Ethylene Production and Carbon Dioxide Exchange by Intact Shoots under Controlled Environmental Conditions. PAWAN K. BASSI AND MARY S. SPENCER
491 Modulation of Chloroplast Fructose-1,6-bisphosphatase Activity by Light. LOUISE E. ANDERSON, HAE-MIN CHIN, AND VIMAL K. GUPTA
495 Water Relations of Cotton Plants under Nitrogen Deficiency. I. Dependence upon Leaf Structure. JOHN W. RADIN AND LINDA L. PARKER
499 Water Relations of Cotton Plants under Nitrogen Deficiency. II. Environmental Interactions on Stomata. JOHN W. RADIN AND LINDA L. PARKER
502 Chloroplast Division and DNA Synthesis in Light-grown Wheat Leaves. STEPHEN A. BOFFEY, J. RAYMOND ELLIS, GUN SELLDÉN, AND RACHEL M. LEECH
506 Isolation and Characterization of the Protein Body Membrane of Castor Beans. IRVIN J. METTLER AND HARRY BEEVERS
512 Natural H^+ Currents Traverse Growing Roots and Root Hairs of Barley (*Hordeum vulgare* L.). MANFRED H. WEISENSEEL, ALFRED DORN, AND LIONEL F. JAFFE
519 Corrections

Number 4. October

521 Temperature-sensitive Responses of Red Light-dependent Betacyanin Synthesis. DAPHNE C. ELLIOTT
525 Psychrophile C-Phycocyanin. STEPHEN M. ADAMS, ORANDA H. W. KAO, AND DONALD S. BERNS
528 Effect of Exogenously Supplied Foliar Potassium on Phloem Loading in *Beta vulgaris* L. DIANE C. DOMAN AND DONALD R. GEIGER
534 Polygalacturonase and Cellulase Enzymes in the Normal Rutgers and Mutant *rin* Tomato Fruits and Their Relationship to the Respiratory Climacteric. B. W. POOVAIAH AND A. NUKAYA
538 Measurement of Ethylene Binding in Plant Tissue. EDWARD C. SISLER
543 A Transformation-induced Alteration of Cellular Membranes in Crown Gall Tumor Cells. LARRY E. COCKERHAM AND CARL V. LUNDEEN
546 Energy-dependent Loading of Amino Acids and Sucrose into the Phloem of Soybean. JEROME C. SERVAITES, LARRY E. SCHRADER, AND DOROTHY M. JUNG
551 Growth and Specific Nodule Activity of Soybean during Application and Recovery of a Leaf Moisture Stress. ROBERT P. PATTERSON, C. DAVID RAPER JR., AND H. DOUGLASS GROSS
557 Relationships between Root Temperature and the Transport of Ammonium and Nitrate Ions by Italian and Perennial Ryegrass (*Lolium multiflorum* and *Lolium perenne*). DAVID T. CLARKSON AND ALISON J. WARNER
562 Regulation of Pyrimidine Biosynthesis in Intact Cells of *Cucurbita pepo*. CAROL J. LOVATT, LUKE S. ALBERT, AND GEORGE C. TREMBLAY
570 Development of Peptide Transport Activity in Barley Scutellum during Germination. TUOMAS SOPANEN
575 Distribution of Lectins in the Jumbo Virginia and Spanish Varieties of the Peanut, *Arachis hypogaea* L. STEVEN G. PUEPPKE
581 Loss of Rubidium and Potassium from Barley Roots on Sudden Chilling. GERARD G. J. BANGE
585 Incorporation of [^{35}S]Sulfate and [^{14}C]Bicarbonate into Karyotype-specific Polysaccharides of *Chondrus crispus*. SUSAN G. JACKSON AND ESTHER L. MCCANDLESS
590 Sulfur Assimilation in C_4 Plants. Intercellular Compartmentation of Adenosine 5′-Triphosphate Sulfurylase in Crabgrass Leaves. B. CLIFFORD GERWICK AND CLANTON C. BLACK JR.
594 A Cytokinin-binding Protein from Wheat Germ. Isolation by Affinity Chromatography and Properties. F. HARDY MOORE III
600 Active Cytokinins. Photoaffinity Labeling Agents to Detect Binding. RENÉ MORNET, JANE B. THEILER, NELSON J. LEONARD, RUTH Y. SCHMITZ, F. HARDY MOORE III, AND FOLKE SKOOG
611 Effect of Abscisic Acid on Root Hydraulic Conductivity. ALBERT H. MARKHART III, EDWIN L. FISCUS, AUBREY W. NAYLOR, AND PAUL J. KRAMER
615 Effect of Fruits on Dormancy and Abscisic Acid Concentration in the Axillary Buds of *Phaseolus vulgaris* L. IMRE A. TAMAS, JIM L. OZBUN, DONALD H. WALLACE, LOYD E. POWELL, AND CAROL J. ENGELS
620 Effect of Older Fruits on Abortion and Abscisic Acid Concentration of Younger Fruits in *Phaseolus vulgaris* L. IMRE A. TAMAS, DONALD H. WALLACE, PAMELA M. LUDFORD, AND JIM L. OZBUN
623 Dimethylsulfoxide as a Potential Tool for Analysis of Compartmentation in Living Plant Cells. DEBORAH P. DELMER
630 Developmental Changes in the Activity of Messenger RNA Isolated from Germinating Castor Bean Endosperm. LYNNE M. ROBERTS AND J. MICHAEL LORD
635 Metabolic and Ultrastructural Changes Associated with Flooding at Low Temperature in Winter Wheat and Barley. M. KEITH POMEROY AND CHRISTOPHER J. ANDREWS

640 *In Vitro* Stability of Nitrate Reductase from Wheat Leaves. III. Isolation and Partial Characterization of a Nitrate Reductase-inactivating Factor. JOSEPH H. SHERRARD, JILLIAN A. KENNEDY, AND MICHAEL J. DALLING
646 Control of Flowering in *Bougainvillea* "San Diego Red." Metabolism of Benzyladenine and the Action of Gibberellic Acid in Relation to Short Day Induction. ZEEV EVEN-CHEN, ROY M. SACHS, AND WESLEY P. HACKETT
652 Rapid Changes in Translocation Patterns in Soybeans following Source-Sink Alterations. ROBERT J. FELLOWS, DENNIS B. EGLI, AND JAMES E. LEGGETT
656 Photosynthetic Oxygen Reduction in Isolated Intact Chloroplasts and Cells in Spinach. THOMAS V. MARSHO, PAUL W. BEHRENS, AND RICHARD J. RADMER
660 Effect of Shoot Removal and Malate on the Activity of Nitrate Reductase Assayed *in Vivo* in Barley Roots (*Hordeum vulgare* cv. Midas). CELIA E. DEANE-DRUMMOND, DAVID T. CLARKSON, AND CHRISTOPHER B. JOHNSON
663 Posttranscriptional Control of Nitrate Reductase of Cultured Tobacco Cells by Amino Acids. YAIR M. HEIMER AND EMANUEL RIKLIS
665 Light Effects on Development of an Indeterminate Plant. DAROLD L. KETRING
668 Thymidylate Synthase Activity from *Chlamydomonas* Cells and Cultured Tissues of *Nicotiana*, *Pinus*, and *Daucus*. VERNON V. VANDIVER JR. AND ROGER C. FITES
671 Comparison of Large Subunits of Type II DNA-dependent RNA Polymerases from Higher Plants. GEORGE H. KIDD, GERHARD LINK, AND LAWRENCE BOGORAD

Number 5. November

675 Proline: A Novel Cryoprotectant for the Freeze Preservation of Cultured Cells of *Zea mays* L. LYNDSEY A. WITHERS AND PATRICK J. KING
679 Cyanide Inhibition of Acid-induced Growth in *Avena* Coleoptile Segments. MORRIS G. CLINE, MICHAEL L. EVANS, AND MARILYN M. REHM
684 L-Malate as an Essential Component of the Xylem Fluid of Corn Seedling Roots. ROBERT G. BUTZ AND RAYMOND C. LONG
690 Effect of Nuclear Mutation in Maize on Photosynthetic Activity and Content of Chlorophyll-Protein Complexes. C. DONALD MILES, JOHN P. MARKWELL, AND J. PHILIP THORNBER
695 Ultrastructural and Enzymic Studies of Cell Membranes from Ice-encased and Noniced Winter Wheat Seedlings. M. KEITH POMEROY AND CHRISTOPHER J. ANDREWS
702 Respiratory Changes with Chilling Injury of Soybeans. A. CARL LEOPOLD AND MARY E. MUSGRAVE
706 Inhibition of Glycine Decarboxylation and Serine Formation in Tobacco by Glycine Hydroxamate and Its Effect on Photorespiratory Carbon Flow. ARTHUR L. LAWYER AND ISRAEL ZELITCH
712 A Circuit Analog Model for Studying Quantitative Water Relations of Plant Tissues. FRED J. MOLZ, DAVID V. KERNS JR., CURT M. PETERSON, AND JACOB H. DANE
717 Effects of Polyamines on Chlorophyll and Protein Content, Photochemical Activity, and Chloroplast Ultrastructure of Barley Leaf Discs during Senescence. ABE S. COHEN, RADOVAN B. POPOVIC, AND SAUL ZALIK
721 Stabilization of Thylakoid Membranes by Spermine during Stress-induced Senescence of Barley Leaf Discs. RADOVAN B. POPOVIC, DAVID J. KYLE, ABE S. COHEN, AND SAUL ZALIK
727 Enzymology of L-Tyrosine Biosynthesis in Mung Bean (*Vigna radiata* [L.] Wilczek). JUDITH L. RUBIN AND ROY A. JENSEN
735 Photosynthesis and Photorespiration in Whole Plants of Wheat. ALAIN GERBAUD AND MARCEL ANDRE
739 Immediate Acetylene Reduction by Excised Grass Roots Not Previously Preincubated at Low Oxygen Tensions. PETER VAN BERKUM AND CHARLES SLOGER
744 On the Mechanism of Activation by Light of the NADP-dependent Malate Dehydrogenase in Spinach Chloroplasts. RENATE SCHEIBE AND ERWIN BECK
749 Photosynthate Partitioning into Starch in Soybean Leaves. I. Effects of Photoperiod *versus* Photosynthetic Period Duration. N. JERRY CHATTERTON AND JOHN E. SILVIUS
754 Seasonal Changes in the Structure and Function of Mitochondrial Membranes of Artichoke Tubers. Acyl Fatty Acid Composition and the Effect of Growth Conditions. GARRY N. HANNON AND JOHN K. RAISON
757 Oxidative Phosphorylation in Pea Cotyledon Submitochondrial Particles. CHARLES GRUBMEYER, DARA MELANSON, IAN DUNCAN, AND MARY SPENCER
763 Nutritive Role of the Seedcoats during Embryo Development in *Pisum sativum* L. DAVID R. MURRAY
770 Relationships between Root System Water Transport Properties and Plant Size in *Phaseolus*. EDWIN L. FISCUS AND ALBERT H. MARKHART III
774 A Mechanism of Chlorosis Caused by 1,3-Dimethyl-4-(2,4-dichlorobenzoyl)-5-hydroxypyrazole, a Herbicidal Compound. KATSUHIKO KAWAKUBO, MASAHIRO SHINDO, AND TAKUO KONOTSUNE
780 Germination-induced Changes in Chromosomal Proteins of Spring and Winter Wheat Embryos. MAMORU SUGITA, KOUICHI YOSHIDA, AND KIMIKO SASAKI
786 Control of Phycoerythrin Synthesis during Chromatic Adaptation. STEVEN GENDEL, ITZAK OHAD, AND LAWRENCE BOGORAD
791 *Azolla-Anabaena* Relationship. VIII. Photosynthetic Characterization of the Association and Individual Partners. THOMAS B. RAY, BERGER C. MAYNE, ROBERT E. TOIA JR., AND GERALD A. PETERS
796 Patterns of Ethylene Production in Senescing Leaves. NEHEMIA AHARONI, MORRIS LIEBERMAN, AND HUGH D. SISLER
801 Ethylene as a Regulator of Senescence in Tobacco Leaf Discs. NEHEMIA AHARONI AND MORRIS LIEBERMAN
805 Production and Action of Ethylene in Senescing Leaf Discs. Effect of Indoleacetic Acid, Kinetin, Silver Ion, and Carbon Dioxide. NEHEMIA AHARONI, JAMES D. ANDERSON, AND MORRIS LIEBERMAN

810 Flowering in *Bougainvillea*. A Function of Assimilate Supply and Nutrient Diversion. ANGELO RAMINA, WESLEY P. HACKETT, AND ROY M. SACHS
814 Senescence of Pear Fruit Cells Cultured in a Continuously Renewed, Auxin-deprived Medium. JEAN-CLAUDE PECH AND ROGER J. ROMANI
818 *Euglena gracilis* Chloroplast DNA Codes for Polyadenylated RNA. JOEL J. MILNER, CHARLES L. HERSHBERGER, AND DENNIS E. BUETOW
822 Control of Seed Germination by Abscisic Acid. I. Time Course of Action in *Sinapis alba* L. P. SCHOPFER, D. BAJRACHARYA, AND C. PLACHY
828 Characterization of the 32,000 Dalton Chloroplast Membrane Protein. III. Probing Its Biological Function in *Spirodela*. STEVEN A. WEINBAUM, JONATHAN GRESSEL, AVI REISFELD, AND MARVIN EDELMAN
833 Isolation and Purification of Leaf Starch Components. CHONG W. CHANG
837 Sucrose Uptake by Sugar Beet Tap Root Tissue. ROGER WYSE
842 Energy-linked Potassium Influx as Related to Cell Potential in Corn Roots. JOHN M. CHEESEMAN AND JOHN B. HANSON
846 Orthophosphate Control of Glucose-6-Phosphate Dehydrogenase Light Modulation in Relation to the Induction Phase of Chloroplast Photosynthesis. STEVEN C. HUBER
852 Relative Sensitivity of Photosynthetic Assimilation and Translocation of ^{14}Carbon to Water Stress. FRANKIE J. M. SUNG AND DANIEL R. KRIEG
857 Azocoll-digesting Proteinases in Soybean Leaves. Characteristics and Changes during Leaf Maturation and Senescence. LAVERNE RAGSTER AND MAARTEN J. CHRISPEELS
863 Enhancement of Polyribosome Formation and RNA Synthesis of Gibberellic Acid in Wounded Potato Tuber Tissue. BERNARD WIELGAT AND GÜNTER KAHL
867 Gibberellic Acid Activates Chromatin-bound DNA-dependent RNA Polymerase in Wounded Potato Tuber Tissue. BERNARD WIELGAT AND GÜNTER KAHL
872 Photosynthate Partitioning in Soybean Leaves at Two Irradiance Levels. Comparative Responses of Acclimated and Unacclimated Leaves. JOHN E. SILVIUS, N. JERRY CHATTERTON, AND DIANE F. KREMER
876 Measurement of Ribulose 1,5-Bisphosphate from Spinach Chloroplasts. RICHARD C. SICHER, JAMES T. BAHR, AND RICHARD G. JENSEN
880 Photosynthesis and Ribulose 1,5-Bisphosphate Levels in Intact Chloroplasts. RICHARD C. SICHER AND RICHARD G. JENSEN
884 Ribulose Bisphosphate Carboxylase and Proteolytic Activity in Wheat Leaves from Anthesis through Senescence. VERNON A. WITTENBACH
888 Economy of Photosynthate Use in Nitrogen-fixing Legume Nodules. Observations on Two Contrasting Symbioses. DAVID B. LAYZELL, ROSS M. RAINBIRD, CRAIG A. ATKINS, AND JOHN S. PATE
892 Measurement of Carbon Dioxide Compensation Points of Freshwater Algae. BRENDAN C. BIRMINGHAM AND BRIAN COLMAN
896 Diurnal Variation *in Situ* of Photosynthetic Capacity in *Ulva* Is Caused by a Dark Reaction. MICHAEL MISHKIND, DAVID MAUZERALL, AND SAMUEL I. BEALE
900 Regulation of Cytoplasmic and Vacuolar Volumes by Plant Cells in Suspension Culture. TREVOR OWENS AND RONALD J. POOLE
905 Effect of Vanadate on Rhythmic Leaflet Movement in *Albizzia julibrissin*. HENRIK SAXE AND RUTH L. SATTER

Number 6. December

909 Characterization of GDP-Fucose. Polysaccharide Fucosyl Transferase in Corn Roots (*Zea mays* L.). DOUGLAS W. JAMES JR. AND RUSSELL L. JONES
914 Intracellular Localization of GDP-Fucose. Polysaccharide Fucosyl Transferase in Corn Roots (*Zea mays* L.). DOUGLAS W. JAMES JR. AND RUSSELL L. JONES
919 Diurnal Ion Fluctuations in the Mesophyll Tissue of the Crassulacean Acid Metabolism Plant *Mesembryanthemum crystallinum*. ARNOLD J. BLOOM
924 Glycerolipid and Fatty Acid Changes in Eastern White Pine Chloroplast Lamellae during the Onset of Winter. DAVID R. DEYOE AND GREGORY N. BROWN
930 Net Photosynthesis and Early Growth Trends of a Dominant White Oak (*Quercus alba* L.). PHILLIP M. DOUGHERTY, ROBERT O. TESKEY, JOHN E. PHELPS, AND THOMAS M. HINCKLEY
936 A Strain of *Rosa damascena* Cultured Cells Resistant to Ultraviolet Light. TERENCE M. MURPHY, CAROL M. HAMILTON, AND HERBERT E. STREET
942 Cold Storage of Isolated Class C Chloroplasts. Optimal Conditions for Stabilization of Photosynthetic Activities. DANIEL L. FARKAS AND SHMUEL MALKIN
948 Swelling and Contraction of Potato Mitochondria. DENNIS W. JUNG AND GERALD P. BRIERLEY
954 Transport of Divalent Cations. Cation Exchange Capacity of Intact Xylem Vessels. SIEBE C. VAN DE GEIJN AND CHARLES M. PETIT
959 Ion Transport in Isolated Protoplasts from Tobacco Suspension Cells. III. Membrane Potential. DONALD P. BRISKIN AND ROBERT T. LEONARD
963 Biochemical Specialization of Photosynthetic Cell Layers and Carbon Flow Paths in *Suaeda monoica*. ADIVA SHOMER-ILAN, RUTH NEUMANN-GANMORE, AND YOAV WAISEL
966 Crystal Morphology and ^{13}Carbon/^{12}Carbon Composition of Solid Oxalate in Cacti. E. R. RIVERA AND B. N. SMITH
971 [^{14}C]Ethylene Metabolism during Leaf Abscission in Cotton. ELMO M. BEYER JR.
975 Germination of Soybean Embryonic Axes. Nucleotide Sugar Metabolism and Initiation of Growth. SHIRLEY RODAWAY AND ABRAHAM MARCUS

982 Photoinhibition of Intact Attached Leaves of C_3 Plants Illuminated in the Absence of Both Carbon Dioxide and of Photorespiration. STEVE B. POWLES, C. BARRY OSMOND, AND SIDNEY W. THORNE
989 Responses of Halophytes to High Salinities and Low Water Potentials. ROBERT L. JEFFERIES, TONY RUDMIK, AND EVA M. DILLON
995 Modification of Herbicide Binding to Photosystem II in Two Biotypes of *Senecio vulgaris* L. KLAUS PFISTER, STEVEN R. RADOSEVICH, AND CHARLES J. ARNTZEN
1000 Effects of Temperature Perturbations on Circadian Conidiation in *Neurospora*. CYNTHIA D. FRANCIS AND MALCOLM L. SARGENT
1005 Isolation and Characterization of Concanavalin A-labeled Plasma Membranes of Carrot Protoplasts. WENDY F. BOSS AND ALBERT W. RUESINK
1012 Effects of Pronase on Isolated Chloroplasts. LEONARD FISH, VINCENT R. FRANCESCHI, AND C. RALPH STOCKING
1015 Kinetics and Time Dependence of the Effect of Far Red Light on the Photoperiodic Induction of Flowering in Wintex Barley. GERALD F. DEITZER, REBECCA HAYES, AND MERTEN JABBEN
1022 Purification and Characterization of the Carboxypeptidase Isoinhibitors from Potatoes. G. MICHAEL HASS, JUDITH E. DERR, DONALD J. MAKUS, AND CLARENCE A. RYAN
1029 Distribution of Carboxypeptidase Isoinhibitors in the Potato Plant. G. MICHAEL HASS, JUDITH E. DERR, AND DONALD J. MAKUS
1032 Metabolism of L-Tyrosine to 4-Hydroxybenzaldehyde and 3-Bromo-4-Hydroxybenzaldehyde by Chloroplast-containing Fractions of *Odonthalia floccosa* (Esp.) Falk. STEVEN L. MANLEY AND DAVID J. CHAPMAN
1039 Properties of Citrate-stimulated Starch Synthesis Catalyzed by Starch Synthase I of Developing Maize Kernels. CHARLES D. BOYER AND JACK PREISS
1043 Effects of Light and Inhibitors on Glutamate Metabolism in Leaf Discs of *Vicia faba* L. Sources of ATP for Glutamine Synthesis and Photoregulation of Tricarboxylic Acid Cycle Metabolism. BRIAN R. JORDAN AND CURTIS V. GIVAN
1048 Mechanism of Decarboxylation of Glycine and Glycolate by Isolated Soybean Cells. DAVID J. OLIVER
1053 Influence of Fusicoccin on the Control of Cell Division by Auxins. ARMEN KURKDJIAN, JEAN-JACQUES LEGUAY, AND JEAN GUERN
1058 Polarographic Study of Oxaloacetate Reduction by Isolated Pea Chloroplasts. JOHN W. ANDERSON AND COLIN M. HOUSE
1064 Polarographic Study of Dicarboxylic-Acid-dependent Export of Reducing Equivalents from Illuminated Chloroplasts. JOHN W. ANDERSON AND COLIN M. HOUSE
1070 Comparative Enzymic Studies of Sucrose Metabolism in the Taproots and Fibrous Roots of *Beta vulgaris* L. JOHN E. SILVIUS AND FREEMAN W. SNYDER
1074 Auxin-induced Ethylene Production and Its Inhibition by Aminoethyoxyvinylglycine and Cobalt Ion. YEONG-BIAU YU AND SHANG FA YANG
1078 Assimilation and Transport of Nitrogen in Nonnodulated (NO_3-grown) *Lupinus albus* L. CRAIG A. ATKINS, JOHN S. PATE, AND DAVID B. LAYZELL
1083 Economy of Carbon and Nitrogen in a Nodulated and Nonnodulated (NO_3-grown) Legume. JOHN S. PATE, DAVID B. LAYZELL, AND CRAIG A. ATKINS
1089 Composition of Lipid-derived Polymers from Different Anatomical Regions of Several Plant Species. KARL E. ESPELIE, BILL B. DEAN, AND P. E. KOLATTUKUDY
1094 Rapid Growth Responses of *Avena* Coleoptile Segments to Lanthanum and Other Cations. KENNETH H. HARMET
1099 Pyruvate Dehydrogenase Complex from Chloroplasts of *Pisum sativum* L. MICHAEL WILLIAMS AND DOUGLAS D. RANDALL
1104 Polyribosomes from Pear Fruit. Changes during Ripening and Senescence. ALAIN DROUET AND CLAUDE HARTMANN
1109 Stress and Protein Turnover in *Lemna minor*. ROBERT J. COOKE, JANE OLIVER, AND DAVID D. DAVIES
1114 Isolation and Partial Characterization of Vacuoles from Tobacco Protoplasts. IRVIN J. METTLER AND ROBERT T. LEONARD
i Title Page
iii Volume Contents
xi Author Index
xv Subject Index

Author Index

A

Abou-Khalil, Samir, 276, 281
Acevedo, Edmundo, 476
Adams, Stephen M., 525
Aharoni, Nehemia, 796, 801, 805
Albert, Luke S., 562
Alberte, Randall S., 25
Alscher-Herman, Ruth, 232
Anderson, James D., 55, 289, 805
Anderson, John W., 1058, 1064
Anderson, Louise E., 404, 491
Andre, Marcel, 735
Andrews, Christopher J., 120, 635, 695
Arntzen, Charles J., 995
Arron, Geoffrey P., 182
Atkins, Craig A., 888, 1078, 1083
Awad, Marcel, 306

B

Bahr, James T., 876
Bajracharya, D., 822
Bange, Gerard G. J., 581
Barnes, Donald K., 1
Bassi, Pawan K., 488
Beale, Samuel I., 896
Beck, Erwin, 744
Beevers, Harry, 31, 506
Behrens, Paul W., 656
Ben-Arie, Ruth, 197
Bendich, Arnold J., 126
Berns, Donald S., 525
Bewley, J. Derek, 13
Beyer, Elmo M., Jr., 971
Birmingham, Brendan C., 892
Black, Clanton C., Jr., 309, 590
Bloom, Arnold J., 919
Boffey, Stephen A., 502
Bogorad, Lawrence, 671, 786
Boss, Wendy F, 1005
Bowen, John R., 382
Bowman, Janette A., 387
Boyer, Charles D., 1039
Bracker, Charles E., 398
Brierley, Gerald P., 948
Briskin, Donald P., 959
Brooks, James L., 220
Brown, Gregory N., 924
Brown, R. Harold, 257
Brownlee, Colin, 206, 211
Bryan, Jeff W., 1
Buetow, Dennis E., 818
Bush, Lowell P., 236
Butz, Robert G., 684

C

Canvin, David T., 354
Carmi, Avner, 285
Chalutz, Edo, 55, 289
Chandorkar, Kashinath R., 300
Chaney, William R., 366
Chang, Chong W., 833
Chapman, David J., 1032
Chatterton, N. Jerry, 749, 872
Cheeseman, John M., 842
Chin, Chee-Kok, 108
Chin, Hae-Min, 491
Chrispeels, Maarten J., 38, 857
Clarkson, David T., 557, 660
Cleland, Charles F., 421
Cline, Morris G., 679
Clough, John M., 25
Cockerham, Larry E., 543
Cohen, Abe S., 717, 721
Colman, Brian, 892
Combrink, Gabriele, 144
Cooke, Robert J., 1109
Creach, Elisabeth, 435
Cress, William A., 484
Croteau, Rodney, 169

D

Dalling, Michael J., 439, 640
Dane, Jacob H., 712
Dashek, William V., 43
Davies, David D., 1109
Day, William, 345
Dean, Bill B., 1089
Deane-Drummond, Celia E., 660
Deitzer, Gerald F., 1015
Delmer, Deborah P., 623
Dench, Jane E., 150
Derr, Judith E., 1022, 1029
DeYoe, David R., 924
DiCamelli, Cynthia A., 269
Dilley, David R., 417
Dillon, Eva M., 989
Doman, Diane C., 528
Dorn, Alfred, 512
Dougherty, Phillip M., 930
Drouet, Alain, 1104
Duncan, Ian, 757
Durley, Richard C., 214

E

Ebel, Jürgen, 371
Edelman, Marvin, 828
Edwards, Gerald E., 182
Egin-Bühler, Barbara, 371
Egli, Dennis B., 652
Elliott, Daphne C., 521
Ellis, J. Raymond, 502
Engels, Carol J., 615
Espelie, Karl E., 1089
Esquerré-Tugayé, Marie-Thérèse, 314, 320
Evans, Michael L., 679
Even-Chen, Zeev, 646

F

Falkowski, Paul G., 49
Farkas, Daniel L., 942
Fellows, Robert J., 652
Fereres, Elias, 476
Finkel, Martin H., 139
Fiscus, Edwin L., 83, 611, 770
Fish, Leonard, 1012
Fisher, Donald B., 481
Fites, Roger C., 668
Fondy, Bernadette R., 361
Franceschi, Vincent R., 1012
Francis, Cynthia D., 1000
Frederick, Paula E., 455
Frenkel, Chaim, 108, 197
Fujimura, Tatsuhito, 162

G

Gardiner, Susan E., 371
Gardner, George F., 472
Gassman, Merrill L., 393
Geiger, Donald R., 361, 528
Gendel, Steven, 786
Gerbaud, Alain, 735
Gerwick, B. Clifford, 590
Gilkes, Neil R., 38
Gill, Marie K., 379
Givan, Curtis V., 1043
Gnanam, A., 263
Gómez-Lepe, Beatriz E., 131
Greenberg, Elaine, 187
Gressel, Jonathan, 828
Gross, H. Douglass, 551
Grubmeyer, Charles, 757
Grumet, Rebeccah, 232
Guern, Jean, 1053
Gupta, Vimal K., 491
Guy, Micha, 61

H

Hackett, Wesley P., 646, 810
Hahlbrock, Klaus, 371
Hall, David O., 150
Hamilton, Carol M., 936
Hankins, Charles N., 104
Hannon, Garry N., 754
Hanson, Andrew D., 460, 467
Hanson, John B., 276, 281, 842
Harmet, Kenneth H., 1094
Hartmann, Claude, 1104
Hass, G. Michael, 1022, 1029
Hatch, Alexander M., 379
Hayes, Rebecca, 1015
Heath, Robert L., 224, 445
Heichel, Gary H., 1
Heimer, Yair M., 663
Heinrikson, Robert L., 404
Heller, Werner, 371
Henderson, Delbert W., 476
Herman, Eliot M., 38
Hershberger, Charles L., 818
Hinckley, Thomas M., 930
Hopkins, Johns W., 374
House, Colin M., 1058, 1064
Housley, Thomas L., 94
Hsiao, Theodore C., 476
Huber, Steven C., 115, 852
Hunt, Robert E., 327, 332
Hurkman, William J., 398
Hüsken, Dieter, 18

I

Israel, Daniel W., 411

J

Jabben, Merten, 1015
Jackson, Christopher, 150
Jackson, Susan G., 585
Jaffe, Lionel F., 512
Jagendorf, André T., 232
James, Douglas W., Jr., 909, 914
James, Terrance W., 431
Janes, Harry W., 108
Jayaswal, Radheshyam K., 154

Jefferies, Robert L., 989
Jensen, Richard G., 876, 880
Jensen, Roy A., 727
Johnson, Christopher B., 660
Johnson, Lois E., 1
Johri, Man Mohan, 154
Jones, Russell L., 909, 914
Jordan, Brian R., 1043
Jung, Dennis W., 948
Jung, Dorothy M., 546

K

Kahl, Günter, 863, 867
Kao, Oranda H. W., 525
Kawakubo, Katsuhiko, 774
Keifer, David W., 165
Kendrick, Richard E., 206, 211
Kennedy, Jillian A., 439, 640
Kennedy, Robert A., 293
Kent, Samuel S., 159
Kerns, David V., Jr., 712
Ketring, Darold L., 665
Khan, F. R., 228
Khan, Mobashsher-Uddin, 300
Kidd, George H., 671
Kindinger, Juanita I., 104
King, Patrick J., 675
Kislev, Naomi, 197
Klepper, Lowell A., 273
Knobloch, Karl-Heinz, 371
Kokkinakis, Demetri M., 220
Kolattukudy, P. E., 1089
Koller, Dov, 285
Komamine, Atsushi, 162
Konotsune, Takuo, 774
Kosuge, Tsune, 382
Kozlowski, Theodore T., 112
Kramer, Paul J., 83, 611
Kremer, Diane F., 872
Krieg, Daniel R., 852
Krochko, Joan E., 13
Kruger, James E., 450
Kuhn, David N., 187
Kurkdjian, Armen, 1053
Kurup, C. K. Ramakrishna, 347
Kyle, David J., 721

L

Lafitte, Claude, 320
Lamoreaux, Robert J., 366
Lamport, Derek T. A., 314
Lamppa, Gayle K., 126
Lawyer, Arthur L., 706
Layzell, David B., 888, 1078, 1083
Leech, Rachel M., 502
Lee-Stadelmann, OkYoung, 131
Leggett, James E., 652
Leguay, Jean-Jacques, 1053
Lem, Nora W., 300
Leonard, Nelson J., 600
Leonard, Robert T., 959, 1114
Leopold, A. Carl, 702
Lewis, Leslie L., 176
Li, Paul H., 351
Lieberman, Morris, 55, 289, 796, 801, 803
Lindsey, Donald L., 484
Link, Gerhard, 671
Loescher, Wayne H., 69
Lonergan, Thomas A., 99
Long, Raymond C., 684
Lord, J. Michael, 630
Lovatt, Carol J., 562
Ludford, Pamela M., 620
Lundeen, Carl V., 543

M

Maas, Eugene V., 139
Maheshwari, Ramesh, 347
Makus, Donald J., 1022, 1029
Malkin, Shmuel, 942
Manchester, Jill, 79, 269
Manley, Steven L., 1032
Marcus, Abraham, 975
Markhart, Albert H., III, 83, 611, 770
Markwell, John P., 690
Marriott, Kathleen M., 445
Marsho, Thomas V., 656
Martinkus, Charlott, 169
Matern, Ulrich, 371
Mattoo, Autar K., 55, 289
Mauzerall, David, 896
Mayne, Berger C., 791
Mazau, Dominique, 320
McCandless, Esther L., 585
McCashin, Barry G., 354
McClure, Peter R., 411
McFadden, Bruce A., 228
Melanson, Dara, 757
Mellon, Jay E., 406
Mettler, Irvin J., 506, 1114
Michaeli, Dorit, 61
Miles, C. Donald, 690
Miller, Marna, 94
Milner, Joel J., 818
Mishkind, Michael, 896
Mohamed, A. Habib, 263
Mollenhauer, Hilton H., 398
Molz, Fred J., 712
Moore, Anthony L., 150
Moore, F. Hardy, III, 594, 600
Moore, Randy, 309
Moreland, Donald E., 115
Morgan, Jack A.; 257
Mornet, René, 600
Morré, D. James, 398
Murphy, Denis J., 428
Murphy, Terence M., 936
Murray, David R., 763
Musgrave, Mary E., 702

N

Nagata, Yoko, 9
Naylor, Aubrey W., 83, 611
Negm, Fayek B., 69
Neumann-Ganmore, Ruth, 963
Nevins, Donald J., 193
Nishimura, Mikio, 31
Nukaya, A., 534

O

Ogata, Gen, 139
Ohad, Itzak, 786
Okita, Thomas W., 187
Oliver, David J., 1048
Oliver, Jane, 1109
Osmond, C. Barry, 982
Outlaw, William H., Jr., 79, 269, 481
Owens, Thomas G., 49
Owens, Trevor, 900
Ozawa, Takashi, 65
Ozbun, Jim L., 615, 620

P

Paliwoda, Stephen G., 112
Palta, Jiwan P., 131
Parker, Linda L., 495, 499
Parkinson, Keith J., 345
Parsons, Lawrence R., 351
Pate, John S., 888, 1078, 1083
Patterson, Robert P., 551
Pech, Jean-Claude, 814
Peters, Gerald A., 791
Peterson, Curt M., 712
Petit, Charles M., 954
Pfister, Klaus, 995
Pharis, Richard P., 214
Phelps, John E., 930
Plachy, C., 822
Polley, L. David, 374
Polya, Gideon M., 387
Pomeroy, M. Keith, 120, 635, 695
Poole, Ronald J., 900
Poovaiah, B. W., 534
Popovic, Radovan B., 717, 721
Powell, Loyd E., 615
Powles, Steve B., 982
Prasad, A. R. S., 347
Pratt, Lee H., 327, 332
Preiss, Jack, 187, 1039
Preston, Ken R., 450
Pringnitz, Deborah J., 293
Pueppke, Steven G., 575

R

Radin, John W., 495, 499
Radmer, Richard J., 656
Radosevich, Steven R., 995
Ragster, LaVerne, 857
Rainbird, Ross M., 888
Raison, John K., 754
Ramina, Angelo, 810
Randall, Douglas D., 1099
Raper, C. David, Jr., 551
Ray, Thomas B., 791
Rehm, Marilyn M., 679
Reinhold, Leonora, 61
Reisfeld, Avi, 828
Riklis, Emanuel, 663
Riper, David M., 49
Rivera, E. R., 966
Roberts, Lynne M., 630
Rodaway, Shirley, 975
Romani, Roger J., 814
Rubin, Judith L., 727
Rudmik, Tony, 989
Ruesink, Albert W., 1005
Ryan, Clarence A., 1022
Rychter, Anna, 108

S

Sachs, Roy M., 646, 810
Saltveit, Mikal E., Jr., 417
Sargent, Malcolm L., 99, 1000
Sasaki, Kimiko, 780
Sassa, Takeshi, 214
Satter, Ruth L., 379, 905
Saunders, James A., 74
Saunders, Joseph W., 236
Saxe, Henrik, 905
Sayre, Richard T., 293
Scheibe, Renate, 744
Schmitz, Ruth Y., 600
Schopfer, P., 822
Schrader, Larry E., 94, 546
Selldén, Gun, 502
Servaites, Jerome C., 546
Setter, Timothy L., 94
Shannon, Leland M., 104
Sharma, Shobhona, 154
Sherrard, Joseph H., 439, 640
Shindo, Masahiro, 774
Shomer-Ilan, Adiva, 963
Sicher, Richard C., 876, 880
Silvius, John E., 749, 872, 1070

Singh, Bibhuti N., 43
Sisler, Edward C., 538
Sisler, Hugh D., 796
Skoog, Folke, 600
Sloger, Charles, 739
Smith, B. N., 966
Snyder, Freeman W., 1070
Sopanen, Tuomas, 570
Spalding, Martin H., 182
Spanswick, Roger M., 165
Spencer, Mary S., 431, 488, 757
Stadelmann, Eduard J., 131
Stafford, Helen A., 176
Stocking, C. Ralph, 1012
Stowe, Bruce B., 472
Street, Herbert E., 936
Strickland, Richard C., 366
Stumpf, P. K., 428
Sugita, Mamoru, 780
Sung, Frankie J. M., 852
Sweeney, Beatrice M., 341

T

Tamas, Imre A., 615, 620
Tanaka, Osamu, 421
Tanner, Widmar, 445
Teeri, James A., 25
Teskey, Robert O., 930
Theiler, Jane B., 600
Thornber, J. Philip, 690
Thorne, Sidney W., 982
Throneberry, Glyn O., 484
Toia, Robert E., Jr., 791
Toppan, Alain, 320
Touzé, André, 320
Tremblay, George C., 562
Tully, Raymond E., 460, 467

V

van Berkum, Peter, 739
Vance, Carroll P., 1
Van de Geijn, Siebe C., 954
Vandiver, Vernon V., Jr., 668
Vick, Brady A., 203
Vlcek, Linda M., 393

W

Wagner, George J., 88
Waisel, Yoav, 963
Wallace, Donald H., 615, 620
Walton, Daniel C., 43
Warner, Alison J., 557
Weidner, Manfred, 144
Weinbaum, Steven A., 828
Weisenseel, Manfred H., 512
West, Charles A., 406
Wielgat, Bernard, 863, 867
Williams, John P., 300
Williams, Michael, 1099
Winner, William E., 13
Withers, Lyndsey A., 675
Wittenbach, Vernon A., 884
Wyse, Roger, 884

Y

Yamaguchi, Masuro, 65
Yamamoto, Ryoichi, 193
Yang, Shang Fa, 1074
Yelenosky, George, 425
Yoshida, Kouichi, 780
Yoshida, Shizuo, 241, 247, 252
Young, Roy E., 306
Yu, Yeong-biau, 1074

Z

Zalik, Saul, 717, 721
Zelitch, Israel, 706
Zimmermann, Don C., 203
Zimmermann, Ulrich, 18

Subject Index

A

Abortion, ABA concentration and, in bean fruit, 620
Abscisic acid (ABA)
  concentration
    abortion and, in bean fruit, 620
    fruit effect on, in bean bud, 615
  -controlled seed germination, 822
  localization, 43
  metabolism, 43
  soybean root conductivity and, 611
Abscission, cotton leaf, [^{14}C]ethylene metabolism during, 971
Acer pseudoplatanus, cell division, fusicoccin and, 1053
Acetaldehyde, potato tuber respiration and, 108
Acetic acid, potato tuber respiration and, 108
Acetylene reduction
  by excised grass roots, 739
  moisture stress and, in soybean leaf, 551
Acid-induced growth, cyanide inhibition of, 679
Adenosine diphosphate, energy-linked accumulation by corn mitochondria, 276, 281
Adenosine triphosphate
  content, respiration and, during desiccation and rehydration of moss, 13
  levels, electrogenesis and, in *Chara*, 165
  sources for glutamine synthesis, 1043
  sulfurylase, in C_4 leaf cells, 590
Albizzia leaflet, rhythmic movement, 905
Aleurone layers, barley, ABA localization and metabolism, 43
Alfalfa
  nitrogen fixation, 1
  nodule development, 1
  vegetative regrowth, 1
Algae (*see also* specific algae)
  CO_2 compensation points, 892
Allium cepa epidermal cells, octylguanidine-protoplasmic properties, 131
Amaranthus tricolor seedlings, red light-dependent betacyanin synthesis, 521
Amino acids
  barley phloem, 460, 467
  composition of pea leaf aldolases, 404
  energy-dependent loading into soybean phloem, 546
  intracellular distribution in protoplast, 88
  nitrate reductase control by, in tobacco cells, 663
  translocation in soybean, 94
Aminoacyl transfer ribonucleic acid synthetases, enol ether amino acids and, 289
Aminoethoxyvinylglycine inhibition of auxin-induced ethylene production, 1074
Ammonium ion
  regulation of photosynthetic carbon flow, 263
  uptake, root temperature and, in ryegrass, 557
β-Amylase, immunohistochemical localization in germinating rice seeds, 337
Anoxia, ribosome-tylakoid association and, in pea, 232
Anthocyanin, intracellular distribution in protoplast, 88
  callus tissue, sorbitol dehydrogenase, 69
  fruit, cell wall, changes in ripening, 197
Arabidopsis
  K uptake, 374
  Ru uptake, 374
Artichoke, mitochondrial membrane changes in dormant tubers, 754
Aspartate, intramolecular labeling pattern, 435
Aspergillus niger, temperature and respiration, 347
Auxin
  control of cell division, 1053
  -induced ethylene production, 1074
Avocado fruit, postharvest variation in cellulase, polygalacturonase, and pectinmethylesterase, 306
Azocoll-digesting proteinases in soybean leaf, 857
Azolla-Anabaena relationship, photosynthesis in, 791

B

Barley
  aleurone layers, ABA localization and metabolism, 43
  flooding injury, 635
  flowering, far red light and induction of, 1015
  leaf
    pyridazinone effects on lipids, 300
    senescence, polyamine effect on, 717
    spermine stabilization of thylakoid membranes during senescence, 721
  mutants, photosynthesis and photorespiration, 354
  phloem, amino acids, 460, 467
  root
    H^+ currents through, 512
    membrane protein release, 139
    nitrate reductase, 660
    Ru and K loss on chilling, 581
  scutellum, peptide transport, 570
  seed, cutin composition, 1089
Bean (*see also* Bush bean; Castor bean; Kidney bean; Mung bean; Pinto bean)
  bud, fruit effect on dormancy and ABA in, 615
  fruit, abortion and ABA concentration, 620
  leaf, photosynthesis regulation, 285
  mitochondria, purification, 150
  plant size and water transport, 770
  regulation of photosynthetic carbon flow, 263
Benzyladenine metabolism, *Bougainvillea* flowering and, 646
Betacyanin synthesis, red light-dependent, 521
[^{14}C]Bicarbonate, incorporation into karyotype-specific *Chondrus crispus* polysaccharides, 585
Black locust tree, freezing injury and phospholipase D, 241, 247, 252
Bougainvillea, flowering, 646, 810
Broccoli, temperature and solvent/solute uptake, 83
Bud, bean, fruit effect on dormancy and ABA in, 615
Bush bean, cytoplasmic volume, 900

C

Cacti oxalate crystals, 966
Cadmium uptake by pine pollen, 366
Callus tissue, apple, sorbitol dehydrogenase, 69
Carbohydrate, *Vicia faba* guard cell, 79
Carbon
  economy, in white lupin, 1083
  flow, *Suaeda monoica*, 963
  photosynthetic, ammonium ion regulation of flow, 263
C_3 and C_4 cycle operation, photosynthesis in *Mollugo verticillata*, populations differing in, 293
C_3 plants, photoinhibition, 982
C_4 plants, leaf, nitrogen assimilation, 309
$^{13}C/^{12}C$, composition of solid oxalate in cacti, 966
^{14}C-Photosynthate, partitioning in soybean, 94
^{14}C translocation, water stress and, 852
Carbon dioxide
  compensation points of algae, 892
  dark fixation in corn, 435
  ethylene and leaf senescence effected by, 805
  exchange, cuvette design for measuring, 488
  fixation pathways, photosynthesis in grass species with differences in, 257
  photoinhibition in C_3 plants in absence of, 982
Carboxypeptidase isoinhibitors from potatoes, 1022, 1029
Carrot
  protoplast, plasma membranes, Con A-labeled, 1005
  synchronous embryogenesis, 162
  thymidylate synthase, 668
Castor bean
  endosperm
    gluconeogenesis, 31
    glycosyl transfer, 445
    mRNA, 630
  seeds, protein body membrane, 506
Cation
  divalent, transport, 954
  exchange capacity of xylem vessels, 954
  fluxes in a CAM plant, 919
  release, effect of Cd uptake by pine pollen on, 366
  uptake by corn mitochondria, 281
Cell (*see also* Guard cell)
  division, fusicoccin influence on auxin control of, 1053
  potential, K influx and, 842
Cellulase, postharvest variation, 306
Cell wall
  enzymes, tomato fruit ripening and, 534

glycoprotein, in fungus-infected plants, 314, 320
pome fruit, changes in ripening, 197
Chara corallina
ATP levels and electrogenesis, 165
cells
elasticity, 18
water transport parameters, 18
Chenopodium album mitochondria, purification, 150
Chilling
injury, respiratory changes with, in soybean, 702
Ru and K loss from barley root caused by, 581
Chlamydomonas cells, thymidylate synthase, 668
Chlorella
glucose transport, 224
membrane permeability, 455
Chloride flux, phytochrome and, in mung bean hypocotyl segments, 211
Chloronema, cell-density-dependent metabolism changes, 154
Chlorophyll
content, polyamines and, 717
-protein mutants, of corn, 690
turnover in *Skeletonema costatum*, 49
Chloroplast
Euglena gracilis, DNA codes or poly(A)-RNA, 818
Kalanchoë, fructose-1,6-bisphosphatase, modulation, 491
lettuce, cold storage, 942
pea
DNA levels, 126
enzymes, 404
fructose-1,6-bisphosphatase modulation, 491
malate shuttle, 1064
oxaloacetate reduction by, 1058
pyruvate dehydrogenase, 1099
pine, glycerolipid and fatty acid changes in winter, 924
spinach
NADP-dependent malate dehydrogenase activation by light, 744
photosynthesis, 656, 846, 880
Pronase treatment, 1012
ribulose-1,5-bisP, 876, 880
Spirodela oligorrhiza, thylakoid protein, 828
tobacco, cold storage, 942
wheat, division, 502
Chlorosis, mechanism of, by a pyrazole compound, 774
Chondrus crispus, karyotype-specific polysaccharides, ^{35}S and ^{14}C incorporation into, 585
Chromatic adaptation, phycoerythrin synthesis during, 786
Chromatin-bound RNA polymerase, GA_3 and, in wounded potato tuber tissue, 863
Circadian conidiation, temperature perturbations and, in *Neurospora*, 1000
Circadian rhythm
bright light and, in *Gonyaulax*, 341
fatty acids and, 472
in O_2 uptake by *Samanea* pulvini, 379
Circuit analog model of plant tissue, 712
Citrate-stimulated starch synthesis, 1039
Citrus leaf, proline and cold hardening, 425
Cobalt ion inhibition of auxin-induced ethylene production, 1074
Cold hardening, proline and, in citrus leaf, 425
Cold storage of isolated class C chloroplasts, 942
Coleoptile, oat
cyanide inhibition of acid growth, 679
response to lanthanum, 1094
Colletotrichum lagenarium-infected muskmelon, cell wall glycoprotein in, 314, 320
Concanavalin A-labeled plasma membranes of carrot protoplasts, 1005
Conductivity, hydraulic, ABA and, in soybean root, 611
Conidiation, circadian, temperature perturbations and, in *Neurospora*, 1000
Corn
cells, freeze preservation using proline, 675
Chl-protein mutants, 690
kernel, citrate-stimulated starch synthesis, 1039
leaf
dark CO_2 fixation, 435
diurnal growth trends, 476
osmotic adjustment, 476
water potential, 476
mitochondria, energy-linked ADP accumulation, 276, 281
RNA polymerase subunits, 671
root
cell potential and K influx, 842
fucosyl transferase, 909, 914
seed, cutin composition, 1089
seedling
diterpene biosynthesis, 406
root, L-malate as xylem component, 684
Cotton
leaf
abscission, [^{14}C]ethylene metabolism during, 971
starch purification, 833
stress photosynthesis and translocation, 852
water relations under nitrogen deficiency, 495, 499
Cottonwood leaf, oscillation effect on gas exchange, 345
Cotyledon
mung bean seedling, phospholipid degradation and synthesis, 38
pea
cyanide-insensitive respiration, 431
submitochondrial particles, oxidative phosphorylation by, 757
soybean, respiratory changes with chilling injury, 702
Cowpea
regulation of photosynthetic carbon flow, 263
root nodules, photosynthate use, 880
Crabgrass leaf
ATP sulfurylase in, 590
nitrogen assimilation, 309
Crassulacean acid metabolism (CAM) plant
leaf mitochondria, 182
mesophyll tissue, diurnal fluctuations in, 919
Cratoneuron filicinum, respiration and ATP content during desiccation and rehydration, 13
Crown gall tumor cells, membrane alteration, 543
Crystal morphology, oxalate, in cacti, 966
Cutin composition, 1089
Cyanide
inhibition of acid-induced growth, 679
-insensitive respiration in pea cotyledons, 431
Cytokinin
-binding protein
ligand specificity, 387
wheat germ, 594
photoaffinity labels, 600
Cytoplasmic enzymes, pea leaf, 404
Cytoplasmic volume, bush bean cells, 900

D

Daylength effect on salicylic acid and flowering in *Lemna*, 421
Deoxyribonucleic acid (DNA)
codes for poly(A)-RNA in *Euglena* chloroplast, 818
-dependent RNA polymerase, GA_3 and, in wounded potato tuber tissue, 863
levels in pea chloroplast, 126
synthesis in wheat leaf, 502
Desiccation, respiration and ATP content in moss during, 13
Diatom, marine plankton, Chl turnover, 49
Dicarboxylic acid-dependent export of reducing equivalents from pea chloroplasts, 1064
1,3-Dimethyl-4-(2,4-dichlorobenzoyl)-5-hydroxypyrazole, mechanism of chlorosis by, 774
Dimethylsulfoxide (DMSO) for compartmentation analysis in living tobacco cells, 623
α,α'-Dipyridyl-induced porphyrin synthesis, reversal in red kidney bean leaves, 393
Diterpene biosynthesis in corn seedlings, 406
Dogwood (*see* Red osier dogwood)
Dolichylphosphate-dependent glycosyl transfer in castor bean endosperm, 445
Dormancy, fruit effect on, in bean bud, 615
Drought resistance, nitrogen nutrition and, in cotton, 495, 499

E

Elasticity, *Chara corallina* cells, 18
Electrogenesis, ATP levels and, in *Chara*, 165
Embryo development, nutritive role of seed-coat during, in pea, 763
Embryogenesis, synchronous, in carrot, 162
Endopeptidases, soybean leaf, 857
Endoplasmic reticulum, castor bean endosperm, glycosyl transfer, 445
Endoproteolytic activities in germinating wheat, 450
Endosperm, castor bean
gluconeogenesis, 31
glycosyl transfer, 445
mRNA, 630
Energy
-dependent loading of amino acids and sucrose into soybean phloem, 546
-linked ADP accumulation by corn mitochondria, 276, 281
-linked K influx, cell potential and, 842
Enol ether amino acids, protein synthesis and, 289
Enzyme
cell wall, tomato fruit ripening and, 534
induction in parsley cells, 371
Ethanol, potato tuber respiration and, 108
Ethylene
binding, measurement in tobacco plants, 538
biosynthesis
IAA-induced, 1074
inhibitors, protein synthesis and, 289
leaf senescence and, 796, 801, 805
measurements, cuvette design for, 488
potato tuber respiration and, 108
production

phosphate-mediated control, 55
postharvest variation in cellulase, polygalacturonase, and pectinmethylesterase in relation to, 306
wound, synthesis, 417
[^{14}C]Ethylene metabolism during cotton leaf abscission, 971
Etioplast membrane, identification in soybean hypocotyls, 398
Euglena
chloroplast, DNA codes for poly(A)-RNA, 818
photosynthesis rhythm, 99
Exoproteolytic activities in germinating wheat, 450

F

Fatty acids
circadian rhythms and, 472
cyclase enzyme, distribution, 203
pyridazinone effects on, 300
winter changes in pine chloroplast, 924
Flavonoid glycoside biosynthesis in parsley, 371
Flooding injury in wheat and barley, 635
Flowering
barley, far red light and induction of, 1015
Bougainvillea, 646, 810
Freeze preservation using proline, 675
Freezing (*see also* Icing)
injury, phospholipase D and, 241, 247, 252
Frost hardiness after water stress, 351
Fruit
bean, abortion and ABA concentration, 620
effect on dormancy and ABA in bean buds, 615
Fucosyl transferase in corn roots, 909, 914
Fumaria hygrometrica, cell-density-dependent metabolism changes, 154
Fungal infection
cell wall glycoprotein, in muskmelon, 314, 320
diterpene biosynthesis in corn seedlings in response to, 406
Fungus, temperature and respiration, 347
Fusicoccin, cell division and, 1053

G

Gas exchange, leaf oscillation and, 345
Germination-induced changes in chromosomal proteins in wheat, 780
mustard seed, ABA-controlled, 822
peptide transport by barley scutella during, 570
Gibberellin
A_3
Bougainvillea flowering and, 646
RNA polymerase and, in wounded potato tuber tissue, 863
RNA synthesis of, in wounded potato tuber tissue, 863
A_{20}, tritiated, metabolism in pea seeds, 214
Gluconeogenesis, castor bean endosperm, 31
Glucose-6-P dehydrogenase light modulation, orthophosphate control of, 846
Glucose transport in *Chlorella sorokiniana*, 224
Glutamate metabolism in *Vicia faba* leaf discs, 1043
Glycerolipid
pyridazinone effects on, 300
winter changes in pine chloroplast, 924
Glycine decarboxylation by isolated soybean cells, 1048
Glycine hydroxamate, glycolate pathway and, 706
Glycolate
decarboxylation by isolated soybean cells, 1048
pathway, glycine hydroxamate and, 706
Glycoprotein, cell wall, in fungus-infected plants, 314, 320
Glycosyl transfer in castor bean endosperm, 445
Gonyaulax circadian clock, bright light and, 341
Grass
photosynthesis in species differing in CO_2 fixation pathways, 257
roots, nitrogenase activity, 739
Growth
acid-induced, cyanide inhibition of, 679
diurnal trends, in corn and sorghum, 476
early trends, in white oak, 930
Guard cell, *Vicia faba*
carbohydrates, 79
phosphoenolpyruvate carboxylase, 269

H

Halophyte
response to high salinity, 989
response to polyethylene glycol, 989
Herbicide
binding to PSII, 995
nitrate, nitrite reduction and, 273
Hippeastrum protoplast, intracellular distribution, 88
Humidity, *Populus* stomatal response to, 108
Hydrogen currents through barley roots, 512
Hydrogen peroxide-mediated oxidation of IAA, 220
Hydrolysis, storage protein, 450
Hydroxybenzaldehyde, L-tyrosine metabolism to, in *Odonthalia*, 1032
Hydroxyproline-rich glycoprotein in fungus-infected muskmelon cell wall, 314, 320
Hypocotyl
mung bean, ion fluxes and phytochrome, 206, 211
soybean, identification of etioplast membranes, 398

I

Ice encasement of winter wheat seedling, 120
Icing (*see also* Freezing)
-induced membranes of winter wheat, 695
Indoleacetic acid (IAA)
ethylene and leaf senescence effected by, 805
hydrogen peroxide-mediated oxidation, 220
-induced ethylene biosynthesis, 1074
Injury
chilling, respiratory changes with, in soybean, 702
freezing, phospholipase D and, 241, 247, 252
Ion
diurnal fluctuations, in CAM plant mesophyll tissue, 919
fluxes, phytochrome and, in mung bean hypocotyl segments, 206, 211
transport
in isolated tobacco protoplasts, 959
in potato mitochondria, 948
temperature and, 83
Isocitrate lyase, seed development and, 228
Itaconate, seed development and, 228

K

Kalanchoë chloroplast, fructose-1,6-bisphosphatase modulation, 491
Kernel, corn, citrate-stimulated starch synthesis, 1039
Kidney bean, red, leaf, reversal of α,α'-dipyridyl-induced porphyrin synthesis, 393
Kinetin, ethylene and leaf senescence effected by, 805

L

Lanthanum, oat coleoptile response to, 1094
Leaf
Albizzia, rhythmic movement, 905
barley
pyridazinone effects on lipids, 300
senescence, polyamine effect on, 717
spermine stabilization of thylakoid membrane during senescence, 721
bean, photosynthesis regulation, 285
citrus, proline and cold hardening, 425
corn
dark CO_2 fixation, 435
diurnal growth trends, 476
osmotic adjustment, 476
water potential, 476
cotton
abscission, [^{14}C]ethylene metabolism during, 971
starch purification, 833
cottonwood, oscillation effect on gas exchange, 345
crabgrass
ATP sulfurylase in, 590
nitrogen assimilation, 309
kidney bean, reversal of α,α'-dipyridyl-induced porphyrin synthesis, 393
measurement of export, 361
pea, aldolases, amino acid composition, 404
pinto bean, ethylene and senescence, 796
Sedum praealtum mitochondria, 182
sorghum
diurnal growth trends, 476
osmotic adjustment, 476
phenylalanine transamination, 176
water potential, 476
soybean
endopeptidases, 857
moisture stress and acetylene reduction, 551
photorespiration in isolated cells, 1048
photosynthate partitioning, 749, 872
spinach
α-linolenic acid biosynthesis pathway, 428
starch metabolism enzymes, 187
sugar beet, ethylene and senescence, 796
tobacco, ethylene and senescence, 796, 801, 805
Vicia faba
glutamate metabolism, 1043
pyridazinone effects on lipids, 300
wheat
chloroplast division, 502
DNA synthesis, 502
nitrate reductase-inactivating factor, 640
nitrate reductase *in vitro* stability, 439
ribulose bisP carboxylase, 880
Lectin
distribution in peanut, 575
legume, 104
Legume
carbon and nitrogen economy, 1083
lectins, 104

nitrogen assimilation, 1078
nodule, photosynthate use, 888
Lemna
salicylic acid and flowering, 421
stress and protein turnover, 1109
Lettuce
chloroplast, cold storage, 942
mitochondria, purification, 150
seed, cutin composition, 1089
Ligand specificity, cytokinin-binding protein, 387
Light (*see also* Ultraviolet light)
activation by NADP-dependent malate dehydrogenase, 744
bright, *Gonyaulax* circadian clock and, 341
far red, effect on photoperiodic induction of flowering in barley, 1015
modulation
glucose-6-P dehydrogenase, orthophosphate control of, 846
of chloroplast fructose-1,6-bisphosphatase in pea and *Kalanchoë*, 491
plant development and, 665
Populus stomatal response to, 108
red, -dependent betacyanin synthesis, temperature-sensitive responses, 521
α-Linolenic acid biosynthesis, elongation pathway, 428
Lipid
-derived polymer, composition, 1089
winter changes in pine chloroplast, 924
Lupin, white
nitrogen and carbon economy, 1083
nitrogen assimilation and transport, 1078
root nodules, photosynthate use, 880

M

Maize (*see* Corn)
Malate
as precursor of tricarboxylic acid cycle, 159
as xylem component in corn seedling root, 684
intramolecular labeling pattern, 435
nitrate reductase and, in barley root, 660
shuttle, of pea chloroplasts, 1064
Malate dehydrogenase, NADP-dependent, activation by light, 744
Membrane
changes in dormant tubers, 754
permeability
effect of Cd uptake by pine pollen on, 366
in *Chlorella*, 455
potential of tobacco protoplasts, 959
protein
in castor bean seeds, 506
release from barley roots, 139
Menthone metabolism, 169
Mesembryanthemum crystallinum mesophyll tissue, diurnal ion fluctuations, 919
Mesophyll tissue, CAM plant, diurnal ion fluctuations, 919
Metabolism
abscisic acid, 43
benzyladenine, *Bougainvillea* flowering and, 646
cell-density-dependent changes, 154
[^{14}C]ethylene, during cotton leaf abscission, 971
glutamate, in *Vicia faba* leaf discs, 1043
menthone, 169
phenylpropanoid, enzymes in parsley, 371
starch, enzymes in spinach leaf, 187
sucrose, in sugar beet roots, 1070
tricarboxylic acid cycle, photoregulation of, 1043
tritiated GA_{20}, in pea seeds, 214
tyrosine, in *Odonthalia*, 1032
Metabolite, anaerobic, toxicity, 120
Mitochondria
artichoke, membrane changes in dormant tubers, 754
corn, energy-linked ADP accumulation, 276, 281
mung bean, permeability, 115
potato, ion transport, 948
purification using silica sol gradient centrifugation, 150
Sedum praealtum leaf, 182
Moisture stress, acetylene reduction and, in soybean leaf, 551
Mollugo verticillata photosynthesis, 293
Monoterpene metabolism, 169
Moss (*see* specific moss)
Mung bean
cotyledon, phospholipid degradation and synthesis, 38
hypocotyl, ion fluxes and phytochrome, 206, 211
lectin, 104
mitochondria
permeability, 115
purification, 150
seedling, phospholipid degradation and synthesis, 38
tyrosine biosynthesis, 727
Muskmelon, fungus-infected, cell wall glycoprotein in, 314, 320
Mustard seed germination, ABA-controlled, 822

N

(+)-Neomenthyl-β-D-glucoside as metabolite of (−)-menthone in peppermint, 169
Neurospora, temperature perturbations, 1000
Nicotiana, thymidylate synthase, 668
Nicotinamide adenine dinucleotide phosphate (NADP)-dependent malate dehydrogenase, activation by light, 744
Nicotine
biosynthesis, 236
in isolated tobacco vacuoles, 74
Nitrate, herbicide effect on, in wheat, 273
Nitrate ion uptake, root temperature and, in ryegrass, 557
Nitrate reductase
-inactivating factor in wheat leaves, 640
in vitro stability, 439
shoot removal and malate effect on, in barley roots, 660
tobacco cells, 663
Nitrite reduction, herbicide effect on, in wheat, 273
Nitrogen
assimilation and transport in white lupin, 1078
assimilation, C_4 plant leaves, 309
deficiency, water relations under, in cotton, 495, 499
economy, in white lupin, 1083
fixation, in alfalfa, 1
-fixing legume nodules, photosynthate use, 880
transport in soybean xylem, 411
Nitrogenase activity by grass roots, 739
Nodule
development, in alfalfa, 1
legume, photosynthate use, 888
Nucleotide sugars in germinating soybeans, 975
Nutrient diversion, flowering and, in *Bougainvillea*, 810

O

Oak
early growth trends, 930
photosynthesis, 930
Oat
coleoptile
cyanide inhibition of acid growth, 679
response to lanthanum, 1094
phytochrome immunoaffinity purification, 332
phytochrome radioimmunoassay, 327
Octylguanidine-protoplasmic properties of *Allium cepa* epidermal cells, 131
Odonthalia floccosa, L-tyrosine metabolism, 1032
Orthophosphate
control of glucose-6-P dehydrogenase light modulation, 846
phytochrome and, in mung bean hypocotyl segments, 211
uptake by corn mitochondria, 281
Osmotic adjustment in corn and sorghum, 476
Oxalate crystals in cacti, 966
Oxaloacetate reduction by pea chloroplasts, 1058
Oxidation, hydrogen peroxide-mediated, of IAA, 220
Oxygen
concentration, effect on CO_2 uptake during preillumination, 435
reduction in spinach, 656
uptake, *Samanea* pulvini, circadian rhythm in, 379
Ozone alteration of *Chlorella* membrane permeability, 455

P

Palisade parenchyma, *Vicia faba*, sucrose pools, 481
Papyrus, xylem vessels, cation exchange capacity, 954
Parenchyma, *Vicia faba* palisade, sucrose pools, 481
Parsley
cells, enzyme induction in, 371
flavonoid glycoside biosynthesis, 371
RNA polymerase subunits, 671
Pea
chloroplast
DNA levels, 126
fructose-1,6-bisphosphatase modulation, 491
malate shuttle, 1064
oxaloacetate reduction by, 1058
pyruvate dehydrogenase, 1099
ribosome-thylakoid association, 232
cotyledons
cyanide-insensitive respiration, 431
submitochondrial particles, oxidative phosphorylation by, 757
leaf aldolases, amino acid composition, 404
protoplast, sugar transport in isolated vacuoles, 61
seed
cutin composition, 1089
tritiated GA_{20} metabolism, 214
seedcoat, nutritive role during embryo development, 763
seedling, wound ethylene synthesis, 417
Peanut
lectin distribution, 575
light effect on plant development, 665

Pear
cells, cultured, senescence of, 814
fruit
cell wall, changes in ripening, 197
polyribosomes, 1104
Pectinmethylesterase, postharvest variation, 306
Penicillium digitatum, phosphate-mediated control of ethylene production, 55
Peppermint, menthone metabolism, 169
Peptide transport by barley scutella, 570
Permeability
Allium cepa epidermal cells, octylguanidine effect on, 131
Chlorella membrane, 455
mung bean mitochondria, 115
pine membrane, 366
Phaseolus coccineus, fatty acids and circadian rhythms, 472
Phenotypic response to environment, *Solanum dulcamara*, 25
Phenylalanine transamination, 176
Phenylpropanoid metabolism, enzymes in parsley, 371
Phloem
barley, amino acids in, 460, 467
loading, K promotion of, in sugar beet, 528
soybean, energy-dependent amino acid and sucrose loading, 546
Phosphate
-mediated control of ethylene production, 55
transport, salt-induced inhibition of, 139
Phosphoenolpyruvate carboxylase, *Vicia faba* guard cell, 269
Phospholipase D, freezing injury and, 241, 247, 252
Phospholipid
degradation, 38
synthesis, 38
Phosphorus absorption kinetics, tomato roots, 484
Phosphorylation, oxidative, by pea submitochondrial particles, 757
photoaffinity labels, cytokinin, 600
Photoinhibition in C_3 plants, 982
Photoregulation of tricarboxylic acid cycle metabolism, 1043
Photorespiration
barley mutants, 354
carbon flow, glycine hydroxamate and, 706
photoinhibition in C_3 plants in absence of, 982
soybean cells, 1048
wheat, 735
Photosynthate
partitioning in soybean, 872
partitioning into starch, 749
use by legume nodules, 888
Photosynthesis
in *Azolla-Anabaena* relationship, 791
in barley mutants, 354
in bean, regulation, 285
induction phase, 846
in *Euglena*, rhythm regulation, 99
in grass species differing in CO_2 fixation pathways, 257
in *Mollugo verticillata*, 293
in spinach chloroplast, ribulose bisP and, 880
in *Ulva*, diurnal, 896
in *Vicia faba*, 159
in wheat, 735
in white oak, 930
of isolated chloroplasts in cold storage, 942
stress, 852
Photosynthetic adaptation, *Solanum dulcamara*, 25
Photosynthetic carbon flow, ammonium ion regulation, 263
Photosynthetic cell layers, biochemical specialization in *Suaeda monoica*, 963
Photosynthetic oxygen reduction in spinach, 656
Photosystem II, herbicide binding to, 995
C-Phycocyanin psychrophile, 525
Phycoerythrin synthesis, control during chromatic adaptation, 786
Phytochrome
immunoaffinity purification, 332
ion fluxes and, in mung bean hypocotyl segments, 206, 211
localization in *Spirogyra*, 9
radioimmunoassay, 327
Pine
chloroplast, glycerolipid and fatty acid changes in winter, 924
pollen, Cd uptake by, 366
thymidylate synthase, 668
Plasma membrane, carrot protoplasts, Con A-labeled, 1005
Pollen, pine, Cd uptake by, 366
Polyadenylate-ribonucleic acid, *Euglena* chloroplast DNA codes for, 818
Polyamines, leaf senescence and, 717
Polyethylene glycol, halophyte response to, 989
Polygalacturonase
postharvest variation, 306
tomato fruit ripening and, 534
Polymer, lipid-derived, composition, 1089
Polymerase, ribonucleic acid, GA_3 and, in wounded potato tuber tissue, 863
Polyribosome
formation, enhancement in wounded potato tuber tissue, 863
pear fruit, 1104
Polysaccharide
fucosyl transferase, in corn roots, 909, 914
karyotype-specific, of *Chondrus crispus*, incorporation of ^{35}S and ^{14}C into, 585
Pome fruit cell wall, changes in ripening, 197
Populus stomata, response to light and humidity, 108
Porphyrin synthesis, α,α'-dipyridyl-induced reversal in red kidney bean leaves, 393
Potassium
flux, phytochrome and, in mung bean hypocotyl segments, 206
influx, cell potential and, 842
ion permeability, 455
loss from barley roots on chilling, 581
promotion of phloem loading in sugar beet, 528
uptake by *Arabidopsis*, 374
Potato
carboxypeptidase isoinhibitors, 1022, 1029
mitochondria, ion transport, 948
tuber
mitochondria, purification, 150
respiration, volatiles and, 108
tuber tissue, wounded
GA_3 and RNA polymerase in, 863
RNA synthesis in, 863
Pressure probe technique to determine elasticity and water transport parameters of cells, 18
Proline
citrus cold hardening and, 425
in freeze preservation, 675
Pronase treatment of isolated spinach chloroplasts, 1012
Protein (*see also* Thylakoid protein)
body membrane, in castor been seeds, 506
-Chl mutants, of corn, 690
chromosomal, germination-induced changes in wheat, 780
content, polyamines and, 717
cytokinin-binding
from wheat germ, 594
ligand specificity, 387
membrane, release from barley roots, 139
storage, hydrolysis, 450
synthesis, rhizobitoxine analogs and, 289
temperature adaptation, 144
turnover, stress and, in *Lemna minor*, 1109
Proton flux, phytochrome and, in mung bean hypocotyl segments, 211
Protoplasmic properties, *Allium cepa* epidermal cell, octylguanidine effect on, 131
Protoplast
carrot, plasma membranes, Con A-labeled, 1005
Hippeastrum, intracellular distribution, 88
pea, sugar transport in isolated vacuoles, 61
tobacco
membrane potential, 959
vacuoles, 1114
tulip, intracellular distribution, 88
Psychrophile, C-phycocyanin, 525
Pulvini, *Samanea*, circadian rhythm in O_2 uptake, 379
Pyrazole compound, mechanism of chlorosis by, 774
Pyridazinone, effects on lipids, 300
Pyrimidine biosynthesis, regulation in summer squash, 562
Pyruvate dehydrogenase, pea chloroplast, 1099

R

Red osier dogwood, frost hardiness after water stress, 351
Regrowth, vegetative, in alfalfa, 1
Respiration
ATP content and, during desiccation and rehydration of moss, 13
changes with chilling injury, of soybeans, 702
cyanide-insensitive, in pea cotyledons, 431
postharvest variation in cellulase, polygalacturonase, and pectinmethylesterase in relation to, 306
potato tuber, volatiles and, 108
temperature and, 347
Respiratory climacteric, cell wall enzymes and, in tomato fruit, 534
Rhizobitoxine analog, protein synthesis and, 289
Rhizobium japonicum inhibition of soybean cell growth, 65
Rhizoid differentiation in *Spirogyra*, 9
Ribonucleic acid (RNA)
messenger, castor bean endosperm, 630
polymerase, GA_3 and, in wounded potato tuber tissue, 863
synthesis in wounded potato tissue, 863
type II DNA-dependent, 671
Ribosome-thylakoid association in pea, 232
Ribulose bisphosphate carboxylase, in wheat leaf, 880
Ribulose 1,5-bisP, in spinach chloroplast, 876, 880
Rice
seed, germinating, enzymic mechanism of starch breakdown, 337
seedling, mechanism of chlorosis by a pyrazole compound, 774

Ripening, pear fruit polyribosomes during, 1104
Root
barley
H^+ currents through, 512
membrane protein release, 139
nitrate reductase, 660
Ru and K loss on chilling, 581
corn
cell potential and K influx, 842
fucosyl transferase, 909, 914
L-malate as xylem component, 684
cowpea, nodules, photosynthate use, 880
grass, nitrogenase activity, 739
soybean, conductivity, ABA and, 611
sugar beet
sucrose metabolism, 1070
sucrose uptake, 837
temperature, uptake of ammonium and nitrate ions and, in ryegrass, 557
tomato, phosphorus absorption kinetics, 484
white lupin, nodules, photosynthate use, 880
Rose, cultured cells, ultraviolet-resistant, 936
Rubidium
loss from barley roots on chilling, 581
uptake by *Arabidopsis*, 374
Ryegrass, root temperature and uptake of ammonium and nitrate ions, 557

S

Salicylic acid, flowering and, in *Lemna*, 421
Salinity, high, halophyte response to, 989
Salt-induced inhibition of phosphate transport, 139
Samanea
fatty acids and circadian rhythms, 472
pulvini, circadian rhythm in O_2 uptake, 379
Sclerotinia libertiana, transglucosylase, 193
Scutellum, barley, peptide transport, 570
Sedum praealtum, leaf mitochondria, 182
Seed
barley, cutin composition, 1089
castor bean, protein body membrane, 506
corn, cutin composition, 1089
lettuce, cutin composition, 1089
mustard, germination, ABA-controlled, 822
pea
cutin composition, 1089
tritiated GA_{20} metabolism, 214
rice, germinating, enzymic mechanism of starch breakdown, 337
Seedcoat, pea, nutritive role during embryo development, 763
Seedling
Amaranthus tricolor, red light-dependent betacyanin synthesis, 521
Arabidopsis, K and Ru uptake, 374
corn
diterpene biosynthesis, 406
root, L-malate as xylem component, 684
development, isocitrate lyase and, 228
mung bean, phospholipid degradation and synthesis, 38
pea, wound ethylene synthesis, 417
rice, mechanism of chlorosis by a pyrazole compound, 774
wheat
ice encasement, 120
icing-induced membranes, 695
protein synthesis, temperature adaptation, 144
Senecio vulgaris, herbicide binding to PSII, 995
Senescence
barley leaf, polyamine effect on, 717
leaf, ethylene and, 796, 801, 805
pear cells, 814
pear fruit polyribosomes during, 1104
Serine formation, inhibition by glycine hydroxamate, 706
Shikimate kinase, sorghum, 382
Silver ion, ethylene and leaf senescence effected by, 805
Skeletonema costatum, Chl turnover, 49
Solanum dulcamara, phenotypic response to environment, 25
Sorbitol dehydrogenase, apple callus tissue, 69
Sorghum
leaf
diurnal growth trends, 476
osmotic adjustment, 476
phenylalanine transamination, 176
water potential, 476
shikimate kinase, 382
stress photosynthesis and translocation, 852
Soybean
assimilate partitioning and transport, 94
cell growth, *Rhizobium* inhibition of, 65
cotyledon, respiratory changes with chilling injury, 702
germinating, nucleotide sugars in, 975
hypocotyl, identification of etioplast membranes, 398
leaf
endopeptidases, 857
moisture stress and acetylene reduction, 551
photorespiration in isolated cells, 1048
photosynthate partitioning, 749, 872
phloem, energy-dependent amino acid and sucrose loading, 546
root conductivity, ABA and, 611
temperature and solvent/solute uptake, 83
translocation patterns, 652
xylem, nitrogen transport, 411
Spermine, stabilization of thylakoid membranes, 721
Spinach
chloroplast
NADP-dependent malate dehydrogenase activation by light, 744
photosynthesis, 656, 846, 880
Pronase treatment, 1012
ribulose 1,5-bisP, 876, 880
leaf
α-linolenic acid biosynthesis pathway, 428
starch metabolism enzymes, 187
mitochondria, purification, 150
Spirodela oligorrhiza chloroplast, thylakoid protein, 828
Spirogyra
phytochrome localization, 9
rhizoid differentiation, 9
Squash, pyrimidine biosynthesis regulation, 562
Starch
metabolism, enzymes in spinach leaf, 187
photosynthate partitioning into, 749
purification, cotton leaf, 833
synthesis, citrate-stimulated, 1039
Stomata, *Populus* clones, response to light and humidity, 108
Stress (*see also* Moisture stress; Water stress)
-induced senescence of barley leaf, spermine stabilization of thylakoid membranes during, 721
photosynthesis and translocation, 852
protein turnover and, in *Lemna minor*, 1109
Suaeda monoica, enzymes and carbon flow, 963
Sucrose
energy-dependent loading into soybean phloem, 546
metabolism in sugar beet roots, 1070
pools in palisade cells, 481
uptake by sugar beet root tissue, 837
Sugar
intracellular distribution in protoplast, 88
nucleotide, in germinating soybeans, 975
transport, in isolated vacuoles, 61
Sugar beet
phloem loading, K promotion of, 528
root
sucrose metabolism, 1070
sucrose uptake, 837
[^{35}S]Sulfate, incorporation into karyotype-specific *Chondrus crispus* polysaccharides, 585
Sulfur assimilation in C_4 plants, 590

T

Temperature
adaptation of protein synthesis, 144
low, flooding injury and, in wheat and barley, 635
perturbations of *Neurospora*, 1000
respiration and, 347
-sensitive red light response, 521
solvent/solute uptake and, 83
Thermomyces lanuginosus, temperature and respiration, 347
Thylakoid membranes, stabilization by spermine, 721
Thylakoid protein, *Spirodela* chloroplast, 828
Thylakoid, ribosome dissociation, in pea, 232
Thymidylate synthase from plants, 668
Tobacco
cells
dimethylsulfoxide for analysis of compartmentation, 623
nitrate reductase, 663
chloroplast, cold storage, 942
ethylene binding, 538
glycine hydroxamate and glycolate pathway, 706
leaf, ethylene and senescence, 796, 801, 805
nicotine biosynthesis, 236
protoplasts
membrane potential, 959
vacuoles, 1114
vacuoles, isolated, nicotine in, 74
Tomato
fruit, ripening, cell wall enzymes and, 534
peroxidase, hydrogen peroxide-mediated oxidation of IAA, 220
roots, phosphorus absorption kinetics, 484
Tortula ruralis, respiration and ATP content during desiccation and rehydration, 13
Toxicity, anaerobic metabolite, accumulating in winter wheat seedlings during ice encasement, 120
Transglucosylase, *Sclerotinia libertiana*, 193
Translocation patterns, soybean, 652
Translocation stress, 852
Tricarboxylic acid cycle
malate as precursor, 159
photoregulation of metabolism, 1043
Tuber
dormant, mitochondrial membrane changes, 754
potato
respiration, volatiles and, 108
tissue, wounded, GA_3 and RNA polymerase in, 863
tissue, wounded, RNA synthesis in, 863
Tulip protoplast, intracellular distribution, 88

L-Tyrosine
biosynthesis in mung bean, 727
metabolism in *Odonthalia*, 1032

U

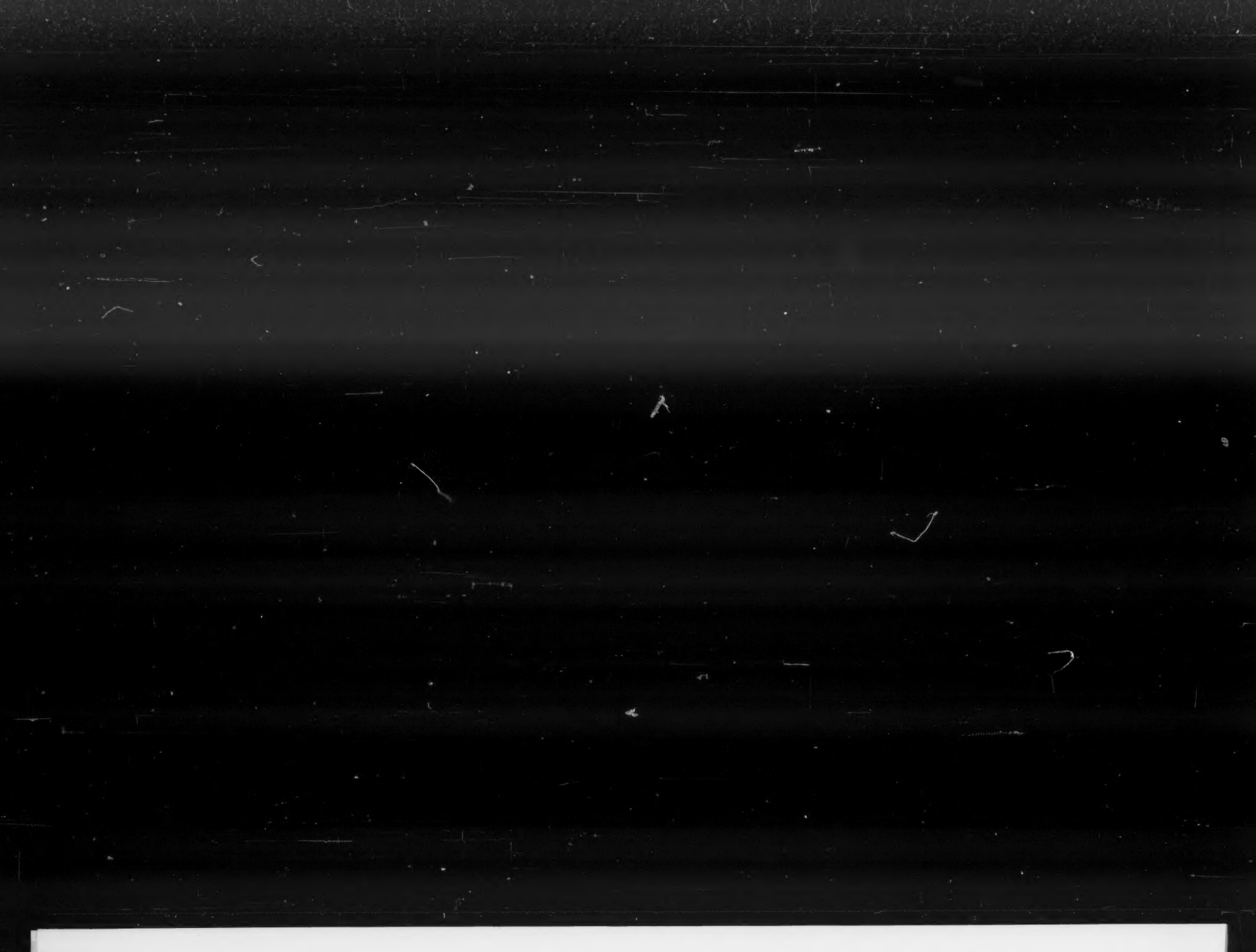
Ultraviolet light-resistant rose cells, 936
Ulva, diurnal photosynthesis, 896

V

Vacuolar volume, bush bean, 900
Vacuole
isolated, sugar transport in, 61
isolated, tobacco, nicotine in, 74
tobacco protoplast, 1114
Vanadate, *Albizzia* rhythmic leaflet movement, 905
Vegetative regrowth in alfalfa, 1
Vicia faba
guard cell
carbohydrates, 79
PEP carboxylase, 269
leaf discs, glutamate metabolism, 1043
leaf, pyridazinone effects on lipids, 300
palisade parenchyma, sucrose pools, 481
photosynthesis, 159
Vinca rosea, membrane alteration in crown gall, 543

W

Water potential in corn and sorghum, 476
Water relations
of cotton plants under nitrogen deficiency, 495, 499
of plant tissues, circuit analog model, 712
Water stress
frost hardiness after, 351
photosynthesis and translocation, 852
Water transport
parameters, *Chara corallina* cells, 18
plant size and, in bean, 770
temperature and, 83
Wheat (*see also* Winter wheat)
chromosomal proteins, 780
flooding injury, 635
herbicide effect on nitrate and nitrite reduction, 273
leaf
chloroplast division, 502
DNA synthesis, 502
nitrate reductase-inactivtating factor, 640
nitrate reductase *in vitro* stability, 439
ribulose bisP carboxylase, 880
photorespiration, 735
photosynthesis, 735
RNA polymerase subunits, 671
seedling
icing-induced membranes, 695
protein synthesis temperature adaptation, 144
Wheat germ, cytokinin-binding protein, 594
Winter wheat seedling, ice encasement, 120
Wound ethylene synthesis, 417

X

Xylem
L-malate as component, in corn seedling root, 684
soybean, nitrogen transport, 411
vessels, papyrus, cation exchange capacity, 954